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HTA report 66

Oral health by jaw orthopedic treatment with fixed appliances

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Oral health after orthodontic treatment with fixed appliances

Wilhelm Frank, Karin Pfaller, Brigitte Konta

DIMDI
deutsche agentur für HTA des
Deutschen Instituts für Medizinische
Dokumentation und Information

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The literature selected according to the criteria of evidence-based medicine. The literature underlying does not claim to be complete.

For better readability, only the masculine form is used in this report when specifying Personenbezeichnun- gen.

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1.1 List of Figures

1.2 List of abbreviations

DIMDI	German Institute for Medical Documentation and Information Health Technology
HTA	Assessment Index of Complexity Outcome and Need
ICON	
IOTN	Index of Treatment Need
IOTN AC IOTN	Index of Treatment Need - Aesthetic Components Index of Treatment
DHC Orthodontic	Need - Dental Health Components Orthodontics
MBS	Multiband system
PAR	Peer Assessment Review
RCT	Randomized Clinical Trial Rapid
RME	Maxillary Expansion
SASOC / DAI	Social Acceptaility Scale of Occlusal Conditions
TMD	Temporomandibular dysfunction
TPI	Treatment Priority Index

1.3 glossary

articulator	Device for simulating the temporomandibular joint movement.
bite	Position to each other of the jaws.
hyperdontia	Dental majority.
hypodontia	Dental outnumbered.
crossbites	The buccal cusps of the mandibular teeth bite on the buccal cusps of Oberkiefersei- tenzähne over.
overjet	Horizontal overbite of the incisors.
occlusion	Position to one another of the teeth.
recurrence	Recurrence.

Directional terms of head teeth and teeth (general)

Proximal	Located toward the midsection. Of the body
Distal	center located away. Means Windwärts, the
Medial	median plane. To the median plane down.
mesial	Sideways. Forward, forward. Front, towards the
Lateral	abdomen. Back to back.
Anterior	
Posterior	
Ventral	

Continued: Glossary

Directional terms at the head (especially)

Frontal	Windwärts forehead. Skull base
Basal	Windwärts. Mouth Windwärts.
Oral	Atrial Windwärts. Lip Windwärts.
Vestibular	Cheeks Windwärts. Tongue
labial buccal	Windwärts. Palate Windwärts.
lingual palatal	Maw Windwärts.
pharyngeal	

Directional terms (special dental-related)

Coronal	Adjacent. Crown Windwärts.
proximal	(Tooth) -halswärts.
cervical	Kauflächenwärts. (Root)
occlusal Apical	-spitzenwärts. Gums
Gingial	Windwärts. Cutting edge
Incisally	Windwärts.

2 Summary

Orthodontic measures represent a significant percentage of dental intervention functions. As with medical methods in the General, the question the way in which there is scientific evidence (evidence) for the effectiveness of these measures. The question of effectiveness is linked to the question of what is understood as an effect. In principle, the effect of the intervention on the basis of occlusion and dental health is understood as suggesting other functions of the oral cavity into account. Therefore, the generalization is meinerung on oral health a now required in science observation. Pays tribute to this development, no study thus is available that examines one hand, the long-term effect of orthodontic intervention, nor one that has an impact on the oral health on the topic.

at the present time the question of whether there is through the use of fixed appliances as part of an orthodontic measure long-term improvement in oral health, can not be answered. The scientific status currently with the definition of oral health. Even the question of whether the dental health can be improved by long-term fixed appliances can not be answered on the basis of the usual for evidence-based medical grade quality.

Whether correction of misaligned teeth is an effective prerequisite for the preservation of the natural dentition, also can not be answered. There are on this subject no generalizable study of significance for Europe or Germany. The risk of tooth decay can be quantified in any way. Caries is discussed as a rule, by a quantification of the risk taken was in all tested waste studies, presumably because it depends on many factors, especially the cooperation of the patient.

The question of the indication positions remain completely open from the scientific literature. Although some indexes have been developed that give the question of the need for treatment or -Priority quantify, these indices are provided but fundamentally in their meaning and the empirical relevance of recent research in question.

There is an impression that a large gap between the practical application exists jaw-orthopedic measures and the scientific study of their effectiveness. There is much research in the field of diagnostics and development of equipment or techniques, but very little in the area of need for intervention, analysis of sustainability factors influencing the success or quantification of side effects such. B. caries or root resorption.

Research to secure the indications is completely lacking, as well as the necessary evalu- ationsparameter (z. B. medium to long-term preservation of teeth) will not be investigated, let alone the oral health.

This gap is so far concern, since a link of the determination of requirement (demand creation) and the performance in Central European health care systems is given. This opens up a framework for the possible creation of a so-called supply-induced demand.

To the professional work of Orthodontics (KFO) does not induce in the near field of demand or bring unnecessary indications, research of this topic is essential. The required much stronger protection of indication criteria for safety and differentiation from non-medically justify services could create significant contributions to further build confidence for patients or insurance companies. Existing for intervention hedge indices to have an academic interest that appear irrelevant in daily practice as the Index of Treatment Need (IOTN) seem. The question which indications can now apply hedged for intervention as scientific, attention must be paid immediately. The individual and subjective assessment of the practitioner (whose experience is not in doubt) is for the

dung by scientifically well-supported studies is absolutely to require the patient Compared to ethical, the social security system due to financial and, ultimately, the practitioner of evaluative and legitimating reasons.

Coordinated research projects which have the goal of targeted data collection before the appropriate design for individual therapeutic processes urgently require sary. The study quality is a major issue. The publication of methodologically completely unusable or afflicted with numerous studies obvious errors is unacceptable in the 21st century in the context of evidence-based medicine, the methods generally known location and the tight financial viability of the health system. Orthodontics deserves, given the position to prove the success a correspondingly high-quality scientific support and secure its approach.

3 Abstract

Orthodontic treatment darstellt to important fraction in dental interventions. .According to other medical methods the question for scientific evidence for the effectiveness of treatments thesis Arises. The question of the effectiveness is connected with the question what is of understood as in effect. In principle, the effect of the intervention is of understood on the basis of the occlusion or dental health, what disregards Further functions of oral health. The generalization to oral health is THEREFORE A Necessary consideration in science now.

If one appreciates this Further development, then there is no one single randomized study available Which examines the long-term effect of the orthodontic intervention or for the effects on the oral health. The question, Whether the application of a fixed appliance in orthodontic treatment to causes a long- term improvement in oral health, can not be answered at the present time. The scientific status is the definition of oral health at present. So the question, Whether in the long run the dental health can be improved by fixed appliances can not be answered with a quality Usually Achieved by evidence-based medicine.

Whether correction of a dental malposition is an effective prerequisite for the preservation of the natural teeth, can not be answered. There is no generalizing study with Sufficient scientific background for Europe or Germany to this topic.

The risk for caries can not be quantified. Caries is Identified as a central topic in general but due to Numerous factors influencing the risk it is not quantified.

The question of the indications is completely Call open from the scientific literature. For the question of the therapy need or therapy priority some indexes were developed, Which lead to a quantification. These indices are HOWEVER Fundamentally criticised by recent research in Their meaning and the empirical relevance.

There is an impression thatthere exists a big gap between the practical application and the scientific investigation of this effectiveness of fixed appliances or orthodontic treatment in general. There is much research in the area of diagnostics or Further development of appliances or techniques done, HOWEVER extremely few in the area of need for intervention, analysis of the sustainability; influence factors on the success, like caries or quantification of side effects eg root resorption. This research to evaluate the indications is completely Call lacking, so the required evaluation parameters (eg Means long-term dental maintenance).

This gap is in this respect dubious since a link of deterministic mining the demand (inducing demand) and supply in Central European health system is Economically given. This Enables to create a Possibility for a so-called supply induced demand.

To get rid of discussions did the professional work of orthodontics can be near to induced demand or unnecessary indications, research of this topic is quite essential. This requires much stronger then comprehensively informed for indications. This can improve confidence for patients and insurance companies. Existing indices like the Index of Treatment Need (IOTN) seem to be of academic interest without practice importance for daily work.

The question Which indications can be Regarded as Scientifically proven for the intervention must be given big attention immediately. The individual and subjective assessment of the orthodontist (Whose experience is not doubted) has to be Considered as not Sufficient. The scientific background is absolutely Necessary due to ethic reasons for the patient, economic reasons for the social insurance system or financiers and thus for the orthodontists to evaluative and legitimates the treatment. Well coordinated research with the goal of collecting specific data is urgently required for individual therapeutic processes with Appropriate design. The study quality is therefore essential to topic. It is unacceptable at the beginning of the 21st century with the background of the evidence-based medicine, did studies are published with enormous methodological errors. Orthodontics deserves a well Discussed scientific position to prove the enormous individual success and to demonstrate the effectiveness of the treatments developed.

4 short version

Orthodontic measures represent a significant percentage of dental intervention functions. As with medical methods in the General, the question the way in which there is scientific evidence (evidence) for the effectiveness of these measures and what side effects are to be expected there.

4.1 Health political background

Orthodontic measures are a frequently performed intervention. Due to the combination of high frequency of use with the respective financial expenses is the scientific protection of the interventions of particular importance. Patients or their parents and financiers are increasingly adapting the question of recoverable impact of these interventions and how these expenses for the health of patients actually well worth the long term.

4.2 scientific background

The effectiveness of medical intervention is usually resolved in scientific studies with patients. It is important to distinguish between standardized and non-standardized interventions. Orthodontic measures are among the non-standardized interventions, since individual treatment plan and a tailored therapy to the patient must be planned.

Furthermore, a large number of techniques and devices used in orthodontic treatment using fixed appliances way that are in their different therapeutic effects.

Through the mounting techniques of fixed appliances oral hygiene more difficult and a patient cooperation required. If this is not enough given this results in spite of successful intervention nevertheless a potentially accelerated loss of teeth because tooth decay or other problems (gum) threaten the durability of the success of the intervention. As a primary goal, the question of the extension of the maintenance of natural teeth can certainly be considered. In addition, an orthodontic measure also affects functional aspects of the oral cavity. Therefore, not only the technical success of achieving normal occlusion can be considered a success, but the oral health must be considered as an entire state image.

The question of the manner in which caries now can actually be seen as a side effect of fixed appliances is also important.

4.3 research questions

This HTA report is the following research questions:

- What is known about the long-term development of the oral health status after orthodontic treatment with fixed appliances? If the Mundgesund- integrated state in the long term better than non-treated patients in orthodontic patients with fixed appliances?
- Is the correction of misaligned teeth an effective prerequisite for the preservation of natural dentition?
- How can the risk of tooth decay in the application of fixed appliances are used? What measures can be taken to prevent tooth decay?
- Which indications for the use of fixed appliances can be recommended for analysis of the scientific literature?
- What role does the interdisciplinary nature or function-oriented approach in the treatment of malocclusions in which fixed appliances are used?

- Is there any scientific literature that deals with the question of economics or ethics the application of fixed appliances?

4.4 methodology

The research questions are evidence-based, that is to be answered from the scientific study situation out. The scientific literature be selected systematically for this purpose. This was done by research literature in literature databases. relevant for answering the questions and quality-tested works were selected and processed in a systematic review in a two-stage process from this work.

4.5 Results

at the present time the question of whether there is through the use of fixed appliances in a kieferor- thopädischen measure long-term improvement in oral health, can not be answered. The scientific status is currently engaged in the definition of oral health. Even the question of whether the dental health can be improved by long-term fixed appliances can not be evaluated on the basis of the usual for evidence-based medical grade quality.

Whether correction of misaligned teeth is an effective prerequisite for the preservation of natural dentition, also can not be answered. There are on this subject no generalizable study of significance for Europe or Germany. The risk of tooth decay can be quantified in any way. Caries is discussed as a rule, however, as this depends on many factors, especially the cooperation of the patient-is refrained in all audited studies of the quantification of risk.

The question of the indication criteria is completely open from the scientific literature. Although some indexes have been developed that give the question of the need for treatment or -Priority a quantification, these indices are provided but fundamentally in their meaning and the empirical relevance of recent research in question.

4.6 discussion

The scientific substantiation of orthodontic treatment is extremely low. None of the questions in this report may be even remotely answered, even if softer types of studies, such as non-randomized or retrospective studies are included.

Of course, the scientific testing of non-standardized interventions of a challenge (therapeutic setting). However, it is basically a demand from a scientific and ethical point of view that interventions on human beings also require appropriate protection. Also payers of interventions can expect a certain degree of safety with regard to the success of this intervention needs to build as well as the consent of the patient for therapy on a secure knowledge as well as a sound prediction of the practitioner.

On the other hand no doubt is to cherish that orthodontic measures are very effective in itself. Hundreds of thousands of successful orthodontic patients treated with great satisfaction certainly bear witness that here very professional intervention with a considerable diagnostic effort be carried out.

There is an impression that this is a large gap between the practice and the scientific study of effectiveness exists. There is much research in the field of diagnostics and development of equipment and techniques, but very little in the areas of need for intervention, analysis of sustainability factors influencing the success or quantification of side effects such. B. caries or root resorption.

Although the effectiveness of interventions due to their obviousness not require further exploration (eg. As the surgical removal of a finger is effective here, no study is needed), as though the question of indications must (when is the surgical removal of a finger required) be scientifically examined and justified. Research to secure the indications is completely lacking, as well as the necessary evaluation parameters (eg. As a medium to long-term preservation of teeth) will not be investigated, let alone the oral health.

This gap is cause for concern inasmuch as it is given zierungssystemen in Central European financing due to the health economic coupling of identification of needs (demand creation) and service delivery. This opens up a framework for the creation of a possible so-called supply-induced demand.

In order not to bring the professional work of Orthodontics in the vicinity of demand creation or unnecessary indications, research of this topic is essential. The derliche require much stronger protection of indication criteria for the safety of differentiation from non-medically justify services could ducks significant contributions to the trust of Pati- or bring insurance companies. The exis-animal end for intervention hedge indices to have little significance that appear lifted in theory, in practice, such as the Index of Treatment Need (IOTN) seem.

4.7 Conclusion / Recommendation

The oral health is relatively new and the first definitions on this subject, there are only a few years. Care must be taken to the interdisciplinary approach to the problem. While the technical implementation of the orthodontic treatment in the focus of interest, the functional relationship of the orofacial region must not be ignored. The cooperation of the patient appears for the functioning of this intervention is also important as the consideration of oral functions, such as chewing, swallowing, hygiene, muscle activity and forces balance.

The oral health, however, following the weak evidence far-reaching systemic consequences for health, like other systemic, eg. , Gastrointestinal, diseases. The question which indications can now apply hedged for intervention as scientific attention must be paid immediately. The individual and subjective assessment of the practitioner (whose experience is not in doubt) is not sufficient to assess the performance of orthodontic treatment as well. The reasoning through scientifically well-supported studies should be required absolute, the patient for ethical, the social security system for financial and ultimately the practitioner from evaluative and legitimating reasons.

Coordinated research projects which have the goal of targeted data collection before the appropriate design for individual therapeutic processes urgently needed. The study quality is a major issue. The publication of methodologically completely unusable or afflicted with many obvious mistakes studies dizin at the beginning of the 21st century in the context of evidence-based metal, the generally known methods situation and the difficult financial viability of the health care system unacceptable. Orthodontics deserves, given the success probably comparable rightly unsuspected a correspondingly high-quality scientific support and secure its approach.

5 Summary

Orthodontic treatment darstellt to important fraction in dental interventions. .According to other medical methods the question for scientific evidence for the effectiveness of treatments thesis Arises.

5.1 Health political background

Orthodontic treatments are a frequent intervention. The scientific position is very important due to the frequency of treatments in combination with financial expenditure. Patients or Their parents or financiers pose more and more the question, Whether thesis interventions are effective and worth the money.

5.2 Scientific background

The effectiveness of medical interventions is Evaluated in scientific studies with patients. It is Necessary to distinguish between standardized interventions and not standardized ones. Orthodontic measures belong to the not standardized interventions since at individual medical treatment planning and a therapy made to measure for the patient must be planned.

Further More, a large number of techniques and appliances are used in orthodontic treatment Which have differences in Their therapeutic effect.

By the techniques of fixed appliances oral hygiene is more difficult to achieve and this needs more cooperation of the patient. Is this not Achieved Sufficiently caries or other problems can lead to a possibly faster dental loss despite a successful orthodontic intervention.

The principal goal is the prolongation of the maintenance of natural teeth. Additionally there are so functional aspects of oral health. THEREFORE not only the technical success of the obtainment of a normocclusion can be Regarded as a success of treatment, but oral health must be Regarded as a comprehensive condition.

The question how caries must be Regarded as a side effect by implementation of fixed appliances is so important.

5.3 Research questions

This HTA report follows the Following research questions:

- Which evidence Concerning long-term development of oral health after to orthodontic treatment with fixed appliances exists? Is the status of oral health better for Treated patients in comparison with not Treated patients in the long run?
- Is the correction of dental malocclusion of effective prerequisite for the preservation of the own teeth?
- Can the risk for caries be Assessed When fixed appliances are used? Which methods can be taken to avoid caries?
- Which indications can be recommended for the application of fixed appliances after analysis of the scientific literature?
- How important is a multi-professional approach and functional oriented treatment in orthodontic application of fixed appliances?
- Are there publications Concerning the economic and ethical aspect of the application of fixed appliances?

5.4 Methods

The research questions Should be answered evidence oriented, gemäß to published scientific studies. The scientific literature had to be selected systematically. This was made by the retrieval of

publications in literature databases. The relevant studies were Evaluated for the questions in a two- step procedure and used for this review.

5.5 results

The question, Whether the application of a fixed appliance in orthodontic treatment to causes a long- term improvement in oral health, can not be answered at the present time. The scientific status is the discussion for a definition of oral health at present. So the question, Whether in the long run dental health can be improved by the application of fixed appliances can not be answered with a level of evidence Usually Achieved by evidence-based medicine.

Whether correction of dental malocclusion is an effective prerequisite for the preservation of the natural dentation, can not be answered. There is no generalizable study with Sufficient scientific background for Europe or Germany to this topic.

The risk for caries can not be quantified. Caries is Identified as a central topic in general but due to Numerous factors influencing the risk it is not quantified.

The question of assessment of indications is completely Call open from the scientific literature. For the question of therapy need or therapy priority some indices were developed, Which enable a numerical quantification. HOWEVER, thesis indices are Fundamentally criticised by recent research in Their meaning and the empirical relevance.

5.6 discussion

The scientific evidence for orthodontic measures is exceptionally low. None of the questions posed in this report can be answered even if lower evidence study types, like not randomized or retrospective studies are included.

The scientific investigation of not standardized interventions is a Certain challenge (therapeutic setting). It is, HOWEVER, a need from the scientific and ethical view, in principle, did interventions therefore require Appropriate research and evidence. Payers of the interventions so can expect a Sufficient degree of reliability, patients can expect, did the intervention is well Investigated and the informed consent is based on scientific research.

Basically there is no doubt that - on the one side did orthodontic treatment is very effective. Dog Hundreds of Thousands of patients Treated orthodontic successfully with great satisfaction surely give evidence, thatthere are very professional interventions Carried out with a diagnostic Considerable effort. There is the impression thatthere exists a big gap between the practical application of fixed appliances and the scientific investigation of the effectiveness of the intervention. There is much research done in the area of diagnostics or Further development of appliances or techniques Realized, HOWEVER extremely few research in the area of treatment need, analysis of the sustainability, influence factors on the success, like caries or quantification of side effects eg root resorption. So if the intervention does not need any Further research Concerning effectiveness due to Their obviousness (eg the surgical resection of a finger is effective, no study is required here), the question of the indication Nevertheless must (when the surgical resection of a finger is required) be Examined Scientifically and the treatment must be justifiable.

This research to evaluate the indications is completely Call lacking, so the required evaluation parameters (eg Means long-term dental maintenance).

This gap is in this respect dubious since a link of deterministic mining the demand (inducing demand) and supply in Central European health system is Economically given. This Enables to create a Possibility for a so-called supply induced demand.

To get rid of discussions did the professional work of orthodontics can be near to induced demand or unnecessary indications, research of this topic is quite essential. The required much stronger then comprehensively informed for indications can improve confidence for patients and insurance companies. Existing indexes like the Index of Treatment Need (IOTN) seem to be of academic interest without relevance for daily work.

The question Which indications can be Regarded as Scientifically proven for the intervention must be given big attention immediately. The individual and subjective assessment of the orthodontist (Whose experience is not doubted) has to be Considered as not Sufficient. The scientific background is absolutely Necessary due to ethic reasons for the patient, economic reasons for the social insurance system or financiers and thus for the orthodontist to evaluate and legitimate the treatment.

5.7 Conclusions / Recommendations

Oral health is a Relatively new concept and the first definitions are published two to three years ago. The interdisciplinary aspect of the problem-shoulderstand increasingly be taken into account. While the technical aspect of the orthodontic treatment is in the center of the interest, the functional aspect of the orofacial system must not be disregarded.

The cooperation of the patient thus Appears as important, like the consideration of mouth functions, like mastication, swallowing, hygiene or muscle activities and balance of the forces for the success of this intervention.

The concept of oral health has shown weak Evidences despite far-reaching systemic Consequences for human health, like gastrointestinal diseases.

The question Which indications can be Regarded as Scientifically proven for a need of an intervention must be given attention immediately. The individual and subjective assessment of the orthodontist (Whose experience is not doubted) has to be Considered as not Sufficient. The scientific background is absolutely be necessary. Well coordinated research with the goal of collecting specific data is urgently required for individual therapeutic processes with Appropriate design. The study quality is therefore essential to topic. It is unacceptable at the beginning of the 21 st century with the conceptional background of evidence-based medicine, did studies are published with enormous methodological errors. Orthodontics deserves a well Discussed scientific position to prove the enormous success and to demonstrate the effectiveness of the treatments developed.

6 main document

6.1 Health political background

A healthy physiological tooth and jaw position is considered the best prerequisite for lifelong preservation of teeth. Thus - it is assumed - later far-reaching health problems or illnesses be delayed or avoided. Orthodontics (KFO) is in this sense an important prophylactic measure and an essential condition for Dentistry. The evaluation of the effectiveness of specific measures orthodontics is the focus of this work.

Orthodontic treatments are seen in the medical context one of the most common measures are made to people. The healthy physiological tooth and jaw position is primarily used for as long as possible preserving their own dentition, but has far-reaching health consequences. Ultimately among the wide-ranging tasks of orthodontics and aesthetic needs and speech abnormalities of patients the limits of medically necessities are elusive.

In recent years, the range of orthodontic treatments of a larger public union attention is subject. On one hand, is a general change from the organ to function-specific viewing determine, which includes, besides the pure orthodontic intervention and the region of the muscles, skeleton and other orofacial dysfunctions or the oral cavity condition. On the other hand, several critical voices that considered in isolation of orthodontic treatment, the sustainability of treatment success is difficult to achieve, thus cost-benefit ratio of this treatment come into play. Orthodontic measures are economically a resource-intensive activity area in the context of oral health. The goal of orthodontics is to prevent undesirable developments of the masticatory either or - if necessary - to treat and resolve. This raises the question whether indication criteria for orthodontic treatment are scientifically well documented. This theme will also be supplied to an evaluation.

should be a range of indications rules to follow - Orthodontic measures are very costly treatments in which - as with any treatment. Now just such indication rules are not difficult to locate and are subject to individual assessment of behan- delnden person, but entire schools or critical views, question the meaning of such interventions. In addition, the incidence of dental caries is a significant side effect silicic ferorthopädischer treatments and can lead to premature loss of teeth in non-adequate supply.

In this assessment the effectiveness of orthodontic treatment from the scientific literature to be displayed. In addition, the most important participatory success factors should be researched, as well as an attempt to clarify the indication rules are made.

6.2 Introduction / Scientific background

The field of orthodontics is still relatively young. Orthodontics is the branch of dentistry that (deformity dental) with the prevention, detection and treatment of deformities of the jaws and teeth concerned.

As an essential co-founder of orthodontic Edward Angle, who is also named fication of the Angle-Classi- applies. This describes the misalignment of the teeth at the first molars and the canines teeth. This classification dates back to the 19th century and is still today widely accepted and used. The first systematic textbooks on orthodontics published by Norman Kingsley 1880 and by Edward Angle, the "father of orthodontics," from 1890th The treatment is usually done either with removable plate apparatuses or functional appliances to orthopedic jaw position correction, fixed braces (Multiband and / or fixed appliance) for correcting a malocclusion,

Palatal or with a combination of removable and fixed braces

(Two-phase treatment), optionally in combination with surgery by oral surgeon.

A healthy physiological tooth and jaw position is considered the best prerequisite for lifelong preservation of teeth. That is why, later - ments partly far-reaching health impair or be delayed or avoided diseases. Orthodontic treatment is in this sense an important prophylactic measure and an essential condition for Dentistry. Their effectiveness is at the heart of this work.

It seems almost logical to assume that there should be a causal link between malocclusion and diseases of the teeth and supporting tissues. In theory, a good oral hygiene at present malocclusions should be carried out more difficult than ideal excluded shaped arches. However, recent studies suggest that the willingness and motivation to good oral hygiene have a much greater impact on the incidence of dental disease than the actual tooth position.

Long-term studies that began in the late seventies, provide information on the relationship between malocclusion and oral health. They examined on large samples successes orthodontic treated people ten and 20 years after treatment showed no difference in the periodontal status of patients takeover is an orthodontic measures had undergone compared to untreated patients of similar age, although found in the treated group improved occlusion could become. They found no evidence that orthodontic intervention prevents Paradontalerkrankungen, but also no evidence that orthodontic treatment increase the risk of diseases of the periodontal apparatus.

Orthodontic measures represent a significant part of interventions within dentistry. The payments made for expenses significantly from an economic perspective and it raises the question of the scientific evidence of these measures. Now, the question of the relationship between patients and orthodontics, must be involved in the functional, aesthetic and psychosocial needs of the patient. This is only possible with treatment strategies that are clinically effective and efficient in which the self-determination of patent tienten is maintained by the principle of informed consent.

In this work will be discussed exclusively to fixed appliances. These intervention functions is denied in part the long-term success because just by fixed appliances such. As compliance with the hygiene of the oral cavity is difficult and in the case of superficial performed oral cavity cleaning may have just the intervention to a deterioration of dental health. The formation of dental caries in areas that are hard to reach through simple hygiene measures, would be almost inevitable consequence. It turns first, in light of the financial costs, but also in the sense of social responsibility, the question having orthodontic measures with fixed appliances which scientific evidence level or what successes.

The measurement of success is a separate issue, there must be distinguished between the short- and long-term success. The attending dentist is mainly interested in the technically successful intervention, this is but the success of efforts. However, these arguments tation assumed that a technically successful orthodontic measure automatically coincides with a successful long-term dental and oral condition of the patient. Precisely this question requires a special examination, because the success for the patient - sozu- the long-term "outcome" say is not successful technical intervention, but the preservation of natural dentition.

The intervention by fixed appliances can not be considered without the environmental conditions. This raises the question of what is known about the long-term development of the oral health status after orthodontic treatment. Is the behenyl exercise of malocclusions an effective prerequisite for the preservation of the natural loading toothing?

In one hand, long-term observation and on the other with the inclusion of the entire system (teeth, jaws, oral health, whole organism), the question arises whether the oral health

state in orthodontic patients treated long term is better than non-orthodontic patients and how safe this assessment can be considered. In detail, in addition to the HTA-compliant analysis of the best available external evidence on the effectiveness of orthodontic measures are also the questions of influencing factors and the indication Fuse are processed. This approach increases the external validity of the findings, there is likely a large gap exists between the results obtained under ideal conditions study results highest evidence and the real conditions in this area.

6.3 research questions

This HTA report is the following research questions:

- What is known about the long-term development of the oral health status after orthodontic treatment with fixed appliances? If the Mundgesund- integrated state in the long term better than non-treated patients in orthodontic patients with fixed appliances?
- Is the correction of misaligned teeth an effective prerequisite for the preservation of natural dentition?
- How can the risk of tooth decay in the application of fixed appliances are used? What measures can be taken to prevent tooth decay?
- Which indications for the use of fixed appliances can be recommended for analysis of the scientific literature?
- There is scientific literature that deals with economic and ethical aspects of the use of fixed appliances?

The research questions are to be won in the research literature, complemented by gray literature and additional content using the answers from base stations. These four questions were answered by a common literature but separate processing using the aktu- economic state of knowledge.

6.4 methodology

The research questions are evidence-based, that is to be answered from the scientific study situation out. This means that your own data analysis, empirical investigations or information on the basis of social empirical studies (eg. As interviews) were conducted.

The scientific literature be selected systematically for this purpose. This was done by research literature in literature databases. DIMDI was responsible for the technical implementation of the electronic search on the basis of agreed tags and Suchstra-strategies.

6.4.1 Methods of obtaining literature

According to the guidelines of evidence-based medicine and the DIMDI the relevant literature was fied identical in all relevant medical literature databases by keyword search. The date of the systematic literature search was the 10/12/2006. It was given as regards the start of the literature search no time restriction, so is the database-specific literature stock of the start of principal search.

A list of those involved in literature databases is annexed seen (Section 10.2, "Databases").

In this primary research were six HTA assessments, 445 economic studies, 534 RCT, 605 reviews, a total therefore found 1,590 studies.

The search had to be applied topically comprehensive as

- The theme Orthodontic could not be made at individual treatment devices or forms of intervention or disease
- In detail, four questions were addressed in parallel
- Basic issues (definition oral health) and exploratory questions were addressed (search for factors that influence the success of therapy, looking for side effects, searching for indication criteria and outcome measures and outcome factors)
- A large number should be covered by different techniques of orthodontics
- The demarcation of removable appliances has proven through-wording as un- cient.

Numerous attempts to deliberately or fragestellung related to identify appropriate studies were carried out in advance and were found to be not effective. Finally, the cherchestrategie in the re- mentioned procedure was chosen.

These studies were reviewed menfassung in a further processing step in content from two independent, familiar with the methodology of evidence-based medicine reviewers based on the title, together. Evaluation criteria are relevance to the research questions and also any recognizable publication type.

After this evaluation step 220 work for a more detailed analysis of this HTA report were selected, which has led to the consideration of the full text.

In the analysis of the full text, finally, the quality or the exclusion criteria were brought again to the application, and quality assessments carried out. Numerous articles proved on closer inspection as an interpretation of the original studies to achieve without further empirical broadening.

6.4.2 search term

The following search terms were entered for the search in the database composite, both alone and in combination with one another:

ORTHODONTIC APPLIANCE; Orthodontics; FIXED APPLIANCE; malocclusion; DENTAL CARIES; CARIES PREVENTION; DENTAL CARIES; DENTAL CARIES SUSCEPTIBILITY; CARIES or caries; RISK and RISK; OUTCOME or RESULT.

An entire list of the combinations of terms and the restrictions on literature types is given in the Annex (Section 10.1, "Tags").

6.4.3 Exclusion criteria of literature

Because of the research, and the substantive assessment of the identified sources, the references were (in the wake of the source research) or publications excluded (as part of the immediate relevance check and the quality assessment) of a further processing:

- Letters, comments, poster presentations
- Studies with removable appliances
- Studies where not specified the type of intervention or could be seen
- originate studies, which were written in any European language or from countries with incomparable care
- Empirical studies without a control group or pure observation series
- Case reports
- Studies that showed an extremely poor quality, eg. B. could not tell if it is an empirical study or an interpretation of secondary data

- Unsystematic review articles (with the predominant character of subjective opinion Author)

- Microbiological or bacteriological studies in dental equipment
- Studies before 1980
- Studies that dealt exclusively with materials, technical questions or metallurgical processing operations

- Studies with content for the training of users
- Studies comparing different methods of tooth cleaning and hygiene (for fixed dental appliances)

- Studies with medical content
- Studies in which fixed dental appliances for other purposes such. B. were used for the treatment of sleep apnea or snoring
- Animal studies
- Studies with surgical interventions
- Studies with the priority treatment of kraniofaziooralen birth defects and other disabilities or

- Diagnostically-oriented studies.

6.5 Results

6.5.1 Results of the literature review

Due to the Erstrecherche the Database composite DIMDI 1,590 studies on the subject have been have found that this which, divided into six HTA assessments 445 economic studies, 534 RCT, 605 Reviews.

These studies were performed as described in chapter 6.4.1 by two independent reviewers assigned to the evidence hierarchies. After this evaluation step 220 work for the HTA report were selected. Step 1:

Elimination of double Publications - were finally switched 199 works excluded 21st

Step 2: Elimination of work, which proved on closer inspection to be publications that had to be called 6.4.3 exclusion criteria of literature, classified.

Step 3: Quality assessment of the work.

6.5.2 Gray literature - hand search

There are numerous review articles on selected sub-chapters that draw on literature that is older than the distinction made in the primary search strategy selection. Referred to in relevant review articles th important literature was sought retrospectively and into the load of abstracts position incorporated.

6.5.3 study quality

Study quality must be considered in the field of orthodontic intervention from the perspective of therapeutic experimental arrangements. The best scientific evidence in health care interventions are always there before, where randomized clinical trials can be performed.

not a single randomized clinical trial could be found for all four issues of this work, which could answer the question in principle, regardless of the quality of this study. The reason for this weak evidence base is partly due to the numerous factors that influence the intervention and thus connected to the other of the highly individualized treatment planning.

Studies that have to deal with the effectiveness of orthodontic treatment not randomized for the most part still blinded, and mostly applied in the design of the longitudinal sectional study. Of course, the classic design of a randomized, double-blind study is not feasible, the question of the fundamental review of the effectiveness of the intervention, however, quite legitimate. The comparison groups - if there were any - are due to a lack of the randomization with numerous potential errors (eg, not groups comparable.) Affected and the level of evidence therefore lower.

Numerous studies involve relatively small sample sizes (ten to 50), which say, through the provision of training, the external validity and the ability to achieve statistically significant results, much more difficult.

Due to the individual treatment planning, the large number of applicable techniques and the numerous, with the result that influence success factors must be considered as a non-standard intervention in the sense of the study arrangement, the orthodontic treatment.

6.5.3.1 External assessments of the quality of studies in orthodontics (orthodontic)

Harrison114 examined the quality of published studies of three important journals in Orthodontics for the period 1989 to 1998 (the "American Journal of Orthodontics", the "British Journal of Orthodontics" and the "European Journal of Orthodontics." 155 studies were identified, total was the quality,

in orthodontic studies were described as

considered insufficient. In addition to numerous detailed analyzes such was. As considered adequate in only 2.6% of the studies blinding, 28.4% of the studies described what happened to failures.
0.6% of the studies had a low risk of susceptibility to study distortions (bias), 88.4% of the studies were subject to a high risk of potential bias (bias) say in the Studienaus-. Vig et al. [215] claim that the bad situation in this field study is thus in the context that the issues of orthodontics are not typical clinical for randomized trials. Orthodontists are not interested in cure rates or reduced disease incidence. Orthodontists were more interested in questions which form of treatment WOULD CHOOSE less time, less discomfort for the patient or less complexity of the treatment by itself. It is unlikely that the currently applied orthodontic Behandlungsstrate- are strategies worthless, because such providers (orthodontist [A. d. V.]) would be shunned by the referring dentist soon. Rather, it was in the interest to investigate over- or Unterlegen- units of some techniques that meet the individual treatment plan, with no general outcome measures, but "subtle differences" determine the outcome [211]. This can be interpreted as an orientation of classic surrogate parameters such. B. angular positions or on the classification of standard bite.

A study by the Cochrane Collaboration regarding the methods of attachment of the brackets is also dedicated to the data situation and study quality. Although the question of this review is not objective of this study, reference is made to the general poor study location. This review article concludes that due to the location study, no conclusion can be drawn that is generally not achieved the evidence quality as the basis of evidence-based medicine. So no randomized controlled trials were identified in this area, where at least the group assignment or group-specific form of treatment was seen in the work.

6.5.3.2 Conclusions from the study location

In practice, a decoupling of academic supplied from the scene seems to play. On the one hand, numerous successful practicing orthodontist at conducting studies not interested and on the other hand, the analysis is the care practice for academic world is not of interest. In addition, it should be noted a certain commercialization in monitoring the care landscape in which about marketing and industrial products incentive effects for patients or orthodontists arise. a demand pressure from patients who specifically informed of industrially manufactured products produced on orthodontist

become. The advantage of such a development is greater standardization of therapeutic intervention, the disadvantage is the reduction of the orthodontist on a diagnostic level, and a purely mechanistic application of this manufactured equipment that - explained in somewhat shortened - only need to be applied.

6.5.4 Methods of information synthesis

The studies proved to be extremely heterogeneous in terms of probing assembly, sample size, the materials used, the technique used, the time of the intervention, risk group - treatment needs, one / two-phase treatment, duration of treatment. This list is incomplete. As a result of this heterogeneity, the shape of the review article without quantifying methods (eg. As meta-analysis) is selected as the basic method of information synthesis.

6.5.5 oral health

The term oral health (oral health) is in German-speaking less common than the term oral health in the English section. There are now numerous attempts at definition. To disconnect the topic a working definition is required.

6.5.5.1 Concept oral health

"Oral health Refers not only to disease-free teeth and periodontal tissues but to freedom from chronic oral-facial pain, oral and pharyngeal cancers, oral soft tissue lesions, birth defects: such as cleft lip and palate, and scores of other diseases and disorders did affect the oral, dental, and craniofacial tissues collectively known as the craniofacial complex "(160 similar to Jefferson expresses 130). "Additionally oral health is intimately linked to general health and is essential for overall well-being" 160th These definitions originate modified from the report "Oral health in America" general surgery (website: www.nidr.nih.gov/sgr/sgrohweb/home.htm, 14.06.2007). Jefferson 130 concludes that there is increasing evidence of the result to abnormalities in craniofacial complex has a considerable effect on the facial aesthetics, TMJ health and physiological health. These abnormalities the emotional and psychological health, behavior, atten- keitsdefizite / hyperactivity disorder, bedwetting and lack of school success can with influence and a headache, pull ear infections, dizziness, hearing loss, scoliosis, Rückgradverkrümmung, psoriasis and a host of other medical problems. The craniofacial complex affects the entire human body 130th McCann et al. 160 the subject of oral health is addressed comprehensively in particular for women. In this review article, numerous connections are shown associated with impaired oral health. These are counted:

- Diabetes mellitus (glucose control)
- Eating disorders (in particular dining / crushing addiction)
- Birth problems (premature birth, low birthweight newborns)
- Cardiovascular disease.

As a non-medical strategies to maintain or restore a Mundge- health are:

- Minimizing alcohol consumption
- Setting tobacco
- Physical activity
- Healthy eating
- self-awareness
- Professional care (regular dental contacts).

It was identified no study that has used as earnings parameters in the train of data collection or analysis, the concept of oral health. The current state of scientific

-scientific discussion is the extension of the approach of tooth on oral health. This term is to gain a first scientific acceptance.

6.5.5.2 oral rehabilitation

In the field of restorative dentistry restoration of dental health is a key issue for many years. The isolated consideration "of a tooth to be restored" in isolation from its surroundings reality is no longer sufficient to be considered for the preservation of a healthy and natural teeth as well. The integration of the jaw system is that advanced approach that integrates orthodontic treatment in the therapeutic process. Orthodontic the thus gained increasing importance in this therapeutic approach is now extended oral rehabilitation.

6.5.5.3 Orthodontic treatments

Orthodontic treatments are realized Siert predominantly by treatment devices. These are by shin [196] in intra- and extra-oral or to subdivide combinations. The intra-oral devices are to be broken in combinations removable and tightly or. especially vestibular plate, disk devices and functional orthopedic device-th are considered removable. When stuck devices inclined plane / space maintainers, small measures and indoor and outdoor arches apply. Devices will come new and further developed for use. The implementation of orthodontic treatment means not only incorporating of standardized mechanical equipment. To achieve a treatment success comprehensive knowledge of the laws of dental development, over the course of the physiological Gewebsumbaus and the tooth migration laws are primarily required. In addition, the knowledge comes to the many genetic factors and the various environmental influences that may affect promote or inhibit the masticatory system and its development as well as treatment procedure and progress of treatment. So any orthodontic treatment case is absolutely individual first analyze and then solve using the respective optimally relevant means. A dentist, "which ignores the fixed cameras, declares himself to be a part of the cases it had no jurisdiction." A dentist, "which ignores the removable devices, explained for the majority of cases it had no jurisdiction" [196th]

Unclear and a definition or determination of the end appears to be an orthodontic treatment in the study area. During the start of treatment appears relatively clearly distinguishable ER, so the question of the completion of treatment is no longer clear-cut. The question of whether the sometimes necessary after treatment measures of retention (maintaining the acquired structures) are to be regarded as an integral treatment component, seems unclear. Thus, the response more difficult for a clearly definable intervention results that could be considered as the basis of efficacy. Consequently, measures the retention part are themselves covered by the investigation.

6.5.5.4 Arguments for orthodontic treatment

An essential basis for orthodontic treatment is to determine the dental Angle classes. The Angle classes take different abnormalities genesis and differently keyed-like morphological peculiarities in one-dimensional viewing in three classes Together [196:]

- Class I: Neutral bite
- Class II malocclusion

  Class II / 1 = distoclusion with proklinierter (protrudierter) maxillary anterior class II / 2 =

  distoclusion with reklinierter (steeply angled) anterior maxillary
- Class III: Mesialbiss (undershot).

In addition, there are other classifications (eg. As Korkhaus), but which have either REGI onsspezifische meaning or are not complete diagnoses [196th]

On the basis of Fernröntenbild-page analysis that takes into account the positional relationship of the upper and / or lower jaw base of the skull reference, as well as cardinal symptoms z. B. (lack of space,

Malocclusion) can be made a sufficiently thorough diagnosis. The Angle- classification is despite repeatedly guided discussions a globally accepted fundamental basis of understanding is (Ehmer from Diedrich 74).

As reasons for the now increased demand for orthodontic treatment are many to name on the degree of purely medical reasons beyond. From the perspective of the patient's aesthetic and functional comfort in the foreground 14th

Further are mentioned as main reasons: the prevention of trauma (such as occlusal traumas), reduction of caries and periodontitis, aesthetic considerations, function-oriented reasons, improved food intake or chewing improved and psychosocial reasons 14, 126th

6.5.5.5 Indications, clinical results

For the determination of a need for treatment diagnostics are used in medicine as a rule, the conclusions on the need and the strength of the intervention. This is similar also in the KFO, wherein the classifications (eg. as by Angle) are an integral part. In addition, the KFO, however, has to meet also other aspects that go zinischen about the extent of the medium. therefore indexes are used primarily for quantifying a need for treatment. These indices are considered as the basis for interventions, but also partly criticized or considered insufficient. In reality, beyond indexes criteria are considered that in Ackerman 1 be classified. Here, an index is indeed regarded as indispensable, but requires extensions to:

- The input of the patient
- The input of doctors (in this case, the dentist)
- functional claims
- Risks of therapy
- Appearance and psychosocial claims (see.

Ackerman 1).

The pre-prosthetic orthodontic treatment can still be considered an integral part of oral rehabilitation 76th However, the transfer of the detected indices to a treatment planning requires a comprehensive diagnosis to be converted into a phase concept of treatment to. Treatment planning (first phase) the following diagnosis is considered necessary 75:

- Clinical / Functional test
- Periodontalstatus
- Checking the occlusion
- Evaluation means articulator
- Finding radiological abnormalities
- Photographic documentation
- Treatment planning and treatment can be divided once in the specified phases 75:

- Präorthodontische phase
- Reduction of marginal inflammation, plaque control, scaling, curettage, "New Attachment" method

- Augmentation of Weichgewebsvolumens, mucosal graft
- Improvement of oral hygiene (tooth decay treatment, interim supply)
- Elimination of dysfunctions - therapeutic position of the mandible
- orthodontic phase
- Findings related biomechanics - Calculation of forces / torques
- Continuous monitoring of periodontal health

- Postorthodontische phase
- Retention> six months
- Periodontal / prosthetic Reevaluation
- Definitive prosthetic restoration
- Recall.

A comprehensive and more precise approach, including recent scientific findings to orthodontic treatment is also clear from Ackerman [1] required. "In 2004, one can well imagine that a patient who asks ten orthodontist for their opinion, also receives ten different treatment plans. It is also easy to imagine that every ten treatment plans will lead to satisfactory results. In terms of effectiveness and efficiency, however, perhaps only one or two that meet the aesthetic, functional and psychosocial needs of the patient can be found at these ten plans. The challenges of the 21st century are for orthodontics in the integration of scientific insights into clinical practice. Until that is done, no exact cost-benefit analyzes for patients will be possible in orthodontics, which means that patients can not really informed consent to their own treatment " [1].

An international comparison of assessments with regard to the need for therapy and clinical decisions primarily in Europa167 examined the variability in the assessment of scores had on a sample of 240 cases that are evaluated in parallel by all participating orthodontist. Numerous subscales for Index of Orthodontic Treatment (IOTN) were applied. By statistical analysis of matches (Kappa values) were determined as well as the reliabilities of the assessments factors that seem to influence this correspondence. Although in principle of interpretation in cross-sectional studies inadequacies up due to the data situation can be argued both random variations in orthodontist in the case of repeated medical findings and found between orthodontists were. The decisions for or against a treatment appears to be systematically affected between the participating countries by the method of financing the treatment, which was interpreted as a function of the market economy. The extent of market participation in the clinical decision making is specified between 24% and 48%. This degree of variability in the professional judgment of the need for therapy stimulates to Richmond et al. [185] Questions to what extent orthodontic measures can be justified and to what extent legal aspects are addressed here. It calls for a more reliable assessment of the therapeutic need for orthodontic intervention, as it represents the individual professional opinion-.

To what extent now deviations from the ideal occlusion now pose a health risk in itself, is of Mohlin and Kurol [166] addressed. It indicates that the selection of patients should be made for orthodontic treatment based on the consequences of malocclusion. There is criticism that the decision is based for or against a jaw-orthopedic intervention too often solely on morphological considerations. Functional, psychosocial and physical criteria are too little involved in the decision process. As for a comprehensive clinical decision-making process required properties are given Toggle:

- gingivitis
- language and speak
- Traumatic dental injuries
- Chewing (occlusal surface)
- Mandibular function / dysfunction
- Displazierter eruption
- Long-term stability of the occlusion
- Cost / benefit considerations
- Psychosocial well-being.

6.5.5.6 Adverse effects

Orthodontic measures have numerous potential side effects. A classi- fication of potential risks was published to systematically look at the the context of treatment planning for specific hazards. These include: problems that can occur during orthodontic treatment:

1) Gewebsbezogene problems

- melting: Demineralization fractures
- Periodontal: gingivitis, bone loss
- Root: absorption
- Pulp: Ischaemia, death
- Soft tissue: iatrogenic damage

2) Treatment-related problems

- incorrect diagnosis
- Incorrect Management (in the sense of treatment technology)
- Patient "non-compliance"

3) Other diseases

- temporomandibular disorders
- periodontal disease

These problems were tabulated without giving any frequency or risk [83rd]

6.5.5.7 Measurement of therapeutic success - Indices - "Outcome Research"

For the quantitative detection of a pathology or a need for intervention, numerous indices are used. Indices are intended to represent a rule the multiple factors that are necessary for an assessment summarized and compressed as a number or profile.

1) Quantification of the malocclusion

The application of IOTN and Peer Assessment Reviews (PAR) is very common. Other indices of malocclusion are the Treatment Priority Index (TPI; 1967) and the Summer's Occlusal Index (1971). Both seem to find widespread use, especially in the United States.

Although the IOTN and the PAR index are estimated to be reliable and valid, the application of another index, the Index of Complexity, Outcome and Need (ICON) is required [65th]
The main reasons are cited:

- PAR and IOTN consider the treatment beginning and end as separate phenomena.
- The need for treatment from the perspective of dental health and from the viewpoint of aesthetic consideration can be contradictory.
- The hierarchical structure of aspects of dental health require different documentation and logs when only subjects are available.
- IOTN and PAR have been validated with the English population and not internationally generalized gemeinerbar.
- The PAR neglected spaces remaining after extraction, tooth position unfavorable cutting and rotations.
- The PAR does not consider periodontal destruction, decalcification, root resorption, dynamic occlusion or facial esthetics.

2) extension to the observation by psychosocial components

The ICON unlike PAR and IOTN consider the following components:

- Aesthetic justification of the treatment
- Psychosocial increase
- Functional improvement and better oral health
- Cleft lip and palate
- crossbites
- "Overjet"
- impacted teeth
- Anterior open bite
- hypodontia
- deep bite
- Contact point misplacement
- "Spacing".

This new index includes an assessment of dental aesthetics, presence of cross-bite, analysis of the position of the teeth in the upper jaw to one another, "buccal segment antero-posterior internal Digivolution" and the anterior vertical relationship [65th]

3) indices for orthodontic treatment priorities

Indexes for a treatment requirement of a prioritization of orthodontic treatment settings are based on the concept of ideal occlusion. Such morphological variations of a constructed standard reflect by Mohlin and Kuro [167] only a biological variation and should never be used as a basis for therapeutic decisions. The evaluation of a need for treatment should be built instead on the consequences of malocclusion for that individual patient. In addition, the various approaches of numerous indices are described in order to conclude the difficulty of the dissipation of the treatment demand from the index. be called:

- Swedish Medical Board Index
- Index of Treatment Need - Dental Health Components (IOTN DHC-index), this complements the Swedish Medical Board index by defined limits
- Orthodontic Treatment Priority Index
- PAR
- Handycapping malocclusion Assessment
- SASOC / DAI (Dental Aesthetic Index)
- IOTN-AC (Aesthetic Component)
- Standardized Continuum of Aesthetic Need

In comparison assessments of selected indices were compared with each other to conclude that orthodontic treatment indices for therapeutic decision is of limited clinical benefit, since they do not reflect the consequences of malocclusion as to the current state of knowledge. Treatment decisions should certainly not be based on descriptions of the bite anomaly that no longer is ultimately as the description of a biological variation [166th]

Jefferson [152] notes that are necessary for a comprehensive evaluation of orthodontic treatment, the medical history, but also eating habits, dental development, dental problems, face and skelletale difficulties, temporomandibular dysfunction, obstruction of the upper airway (mouth breathing) and abnormal myofunctional habits. It is noted that the majority of orthodontic problems with skeletal problems is associated and a cephalometric analysis is considered appropriate. In addition to screening for temporomandibular dysfunction evaluation of the upper airway is

Importance as such. B. Pull the mouth breathing, abnormal muscular activity of the face and tongue itself. In 1906, the relationship between mouth breathing and facial and dental abnormalities have been described. Also swollen tonsils can drag orthodontic problems by themselves [130th]

In relation to the reasons why the tooth development can develop abnormal counts Jefferson [130]
expressly myofunctional problems such as mouth breathing, thumb sucking or lip, "forward tongue thrust" or deviating swallowing pattern. Sucking on pacifiers, bottle-feeding and sucking of foreign objects such as pencils different contractual myofunctional habits lead to pulling the behavior of the tongue, face and consequently deviations in the tooth development by itself.

4) Objective of orthodontic treatment

Basically, the school believes the result to the achievement of Angle Class 1 is the primary goal of orthodontic treatment is still valid. This principle, which is based on the classification Angle- 19th century considered separately in the recent past more and more and perspective taking into account the "technically feasible". In the specific economic and functional aspects are nowadays strongly considered. So see Carano et al. [38] achieving a long-term stability as a goal in and discard it at the expense of optimal occlusion. Inadequate patient compliance and intolerance against the forces of the masticatory system are the main reasons for this is that a treatment plan must always be a compromise. Such a compromise is accepted as a rule, as long as the aesthetic component is guaranteed. It is also tolerated in most cases, if the patient is symptom-free on the basis of orthodontics.

6.5.6 Content and evaluation of the literature

6.5.6.1 introduction

Numerous studies deal with the analysis of the effectiveness of orthodontic treatment. Orthodontic treatment devices can both detachable and tightly or be in combinations [196th] In the orthodontic practice there is often the need for a two-phase treatment. The first phase, which usually begins at an early stage (mixed dentition), is often carried out with removable devices. In a possible second phase (lasting dentition) are often associated fixed apparatus for the application. In application of fixed appliances always work continuous forces. In contrast, removable appliances intermittent (interrupted) work with compared to fixed appliances smaller forces.

6.5.6.2 Applying fixed appliances

There are numerous types of fixed cameras. An overview (not exhaustive) at Knak [139] specified. Be distinguished:

- Multiband devices (multi-band system (MBS) = brackets) than fixed appliances in the narrow sense as well
- Apparatuses, which also act as tightly or snugly in part, but in the broader sense.

These include:

- Apparatuses for maxillary expansion
- Quadhelix
- "Flex Developer"
- Autumn hinge
- Jasper jumper
- "Sabbagh Universal Spring"

- Nancebogen
- lingual
- "Bite Plane"
- "Bite Turbos"
- "Lip bumper"
- Transpalatal (eg., Soldered)
- Distaljet
- Pendulum
- Orthodontic aid (elastics, spikes, clamps).

Indications for the application of fixed appliances is (adapted from Knak [139] and Diedrich [74]) especially mentioned:

- Pronounced malocclusions
- lack of space
- Angle classes
- Required multiple tooth movement
- Tilting, righting, torquende, rotating, and transverse distallisierende Zahnbewe- conditions in one or both jaws
- Orthodontic / prothethische measures
- Combined orthodontic / surgical treatments.

Fixed devices have the following advantages in the light of alternative opportunities in the orthodontic and disadvantages.

Pros / cons of fixed appliances (after Knak [139])

Advantages:

- Regardless of the patient's cooperation in relation to the wearing time
- No loss possible (even during sleep)
- Delicate tooth movement
- Physical, tilting, rotating, righting tooth movements
- Precise shaping and leveling of the dental arches.

Disadvantage:

- Lack of success in poor employees (eg. As hooking rubber bands)
- Limited cleanability of the teeth
- visual impact
- Gingivitis
- Zahnentkalkung and caries
- root resorption
- TMJ
- Fracture of non-vital teeth in quantities
- Loosening of prosthetic work
- Damage plastic fillings and veneers
- Relapse after treatment.

The application of the individual devices is usually based on a completely individual treatment planning. Systematic reviews on the pros and cons of each device could not be found in the literature.

Working principle of orthodontic treatment

Fixed appliances allow for different tooth movements. It can be righting (mesial, distal), labial perform movements of the root tip and tooth rotations (the lip), lingual (to the tongue), palatal (the palate).

Each tooth movement causes a pressure and / or tension zone in the periodontal ligaments. The pressure generated on one side of the tooth bone loss, the train on the other side produces bone attachment. This depends essentially on the tooth root surface, the patient's age, the occlusion and the amount of force applied. Larger teeth with multiple or long roots can be moved more slowly than smaller teeth and a few roots.

possible side effects

Brezniak and Wasserstein [36] describe the orthodontically induced inflammatory process, leading to a root resorption. This process is considered to be unavoidable pathologic consequence of orthodontic movement of teeth that comes about due to the applied forces. The orthodontic appears as the only discipline, the desired effect (functional and aesthetic problem solving) based on the basis of a specific inflammatory process [36th] Despite a large number of literature sources in this publication, the risk of root resorption is neither quantified yet identified specially vulnerable patient groups.

Effectiveness of orthodontic treatment

Few studies, however, numerous publications deal with the analysis of the effectiveness of orthodontic treatment. especially the pure effectiveness published in the sense of evidence-based medicine on the basis of studies to be determined (based on patient documentation) from the available study literature. This includes the analysis primarily high-quality studies in mind the hierarchy of evidence that can determine a scientifically proven "efficacy" (efficiency under ideal conditions). Here, recent scientific literature between the short-term success and long-term intervention successes should therefore be distinguished. A randomized clinical trial with 71 patients from 2004 [127] evaluated the effect of Laceback- ligatures. Here, this technique is on effectiveness evaluation (previous Extraktionsthera- pie the first premolars and application of fixed appliances). This technique has shown significant results, in particular, a significant improvement of a favorable movement of the lower first molar.

In a 2006 study, which was carried out on 14 children (15 controls) evaluated the efficacy of an application of fixed appliances [13th] the rapid maxillary expansion was employed (Rapid Maxillary Expansion [RME]) Class III and Class I patients showed significant group-specific differences when compared to baseline. It was found sig- nifikante changes in the protraction of the maxilla and achieves an approximation to a class I. The ratios of the lips also change significantly and the patient achieved an improved orthognatisches profile after treatment, although they still had class III characteristics. This study from Turkey on the basis of a total of 29 non-randomized patients showed - despite a very low power of data analysis that significant results are "easy" to obtain. This method is now one of many that can be applied and emphasizes the need for research in this field.

A study on the efficacy and duration of treatment a fixed appliance for the maxilla and mandible while pointing in the introductory statement to previous studies on the effectiveness of orthodontic intervention. These studies were not included in this current research and are from the years 1975 to 1993. As the question of the effectiveness increasingly from patients or demanded by funding agencies, the need for tests of this kind in the recent past is reinforced given [52nd] For this reason, a study was initiated and evaluated on the basis of 177 patients using the PAR and fed to a Einphasenbehandlung. The average duration of treatment was 24.9 months, the results appear in the high degree methodologically implausible. While the whole group a significantly reduced PAR index identifies them as what comes after the treatment compared to the period before treatment

is significantly specified, is significantly associated with a very small group of 18-year-old a lesser PAR-difference before and after the treatment, however. While the statistical, non-parametric testing emphasizes the multiple stepwise regression is used for detailed analysis, which provides a high degree higher demands on the data. Serious statistical and methodological flaws seem to underlie this work, and that for determining the differences, the groups were considered independent (Mann-Whitney U test, which noticed the way does not compare mean values - as alleged [A. d V. .]). The results are given only in the form of PAR index reductions without taking orthodontic interpretation before.

Long-term treatment success

Question: What is known about the long-term development of oral health, states after orthodontic treatment? If the oral health status in orthodontic patients treated long term better than non-orthodontic patients?

From the perspective of the health system medical correction of deformities must be seen as a classic surrogate parameters. This medically important success factor is then meaningful as a result parameters when using this measure, the absolutely essential endpoint - can be achieved - the long-term oral health condition. A retrospective longitudinal study from New Zealand [198] for a period of 14 years (classification at the age of twelve, evaluation by the age of 26) on the basis of a register proves that orthodontic measures do not lead to damages at the same time it is shown that for the determination of the effectiveness of orthodontic treatment in the light of evidence-based medicine is no evidence. The findings of the clinical practice based, according to statements made in this study usually on case reports, case series, cross-sectional studies and anecdotal reports. Long-term studies based on controlled studies are completely lacking [205th]

A retrospective study that investigated the long-term effect of anterior open bite in the method of extraction therapy involving fixed appliances, shows statistically hochsigni- nificant results in the reduction of overbite in the permanent dentition and numerous other parameters when comparing before and after therapy [69th] At the same time is spoken in the study of the non significance of the reduction in the overbite and indicated possible explanations for the failure. The notes and the results presented seem to be in a loading trächtlichen contradiction that should be that the authors can not interpret the concept of statistical significance, because in fact a p-value of p = 0.000 was specified. Serious deficiencies in the methodology can only be accepted here, although this study pursued an ambitious goal.

This question can be answered by any single study. The evidence of these two studies mentioned can be considered as not sufficient to answer the question satisfactorily.

The main reasons are:

- Concept of oral health is not (yet) taken into account.
- The Identified studies represent an intervention that can not be considered as representative of the orthodontic treatment with fixed appliances.
- The studies show serious statistical and methodological flaws.
- The studies also point out the danger of numerous distortions.

Further studies, especially in the sense of the question needed to this question can ever answer and another with sufficient hardness of the evidence first.

Malocclusion - natural dentition

Question: Is the correction of misaligned teeth an effective prerequisite for protecting natural dentition?

This question has been tested by a single study. There were indications that Indian orthodontics measures result in no damage, but whether positive formulated correcting

Misaligned teeth leads to a preservation of natural dentition must remain completely open. Also, extensive research was able to identify this issue, no study carefully.

tooth decay

Question: How can the risk of tooth decay can be estimated? What measures can be taken to prevent tooth decay?

Tooth decay is a topic that is discussed in numerous publications. Above all, the difficult conditions for the patient to independently obtain sufficient oral hygiene are considered to be major problem of orthodontics.

There is throughout the research not a single study that would (only for a specific intervention technique) quantifies the risk of tooth decay. The question must remain completely open. Further studies appear urgently necessary to write the problem in the frequency loading order on this basis countermeasures in their effectiveness to assess.

indication criteria

Question: Which indication criteria for orthodontic treatment can be recommended for analysis of the scientific literature?

With indication positions of the attempt to standardize the treatment needs is considered. Since orthodontic treatment (or both) depending on the financing background either the budget of the patient or the health insurance burden, the question is essential when a therapy appears to be necessary. A Longitudinal Study of Birkeland et al. [29] examined the factors which are capable of influencing the outcome of orthodontic treatment. The aim of this study was among 359 children who were eleven and 15 years old to examine their own views and the views of parents regarding their attitudes for or against orthodontic treatment. were also evaluated pensionable transfer rates and the

actual

Treatment. The need for treatment was determined by the need for treatment index (IOTN).

The aesthetics was the most cited reason for orthodontic treatment. For the analysis of treatment initiation, the concern of the parents and their attitude to fixed orthodontic appliances were instrumental. The setting of the eleven itself was "less significant". Children of the untreated group with a later decision to treat could be rated at changes in the aesthetic component of IOTN best. The results show - the authors conclude this publication - that dentists play a key role in the of destination of the orthodontic treatment needs. High transfer rates minimize the risk of withholding a patient's treatment. "Here, the treatment could be directed as desired by the orthodontist" 29th However, the individual difference in the attitude and desire treatment affects the start of treatment even in those children who have a great need for treatment. As for the number of transfers and the frequency of treatment and initiation of treatment was found for the eight participating dental clinics a great variability.

Other factors for the treatment needs (explanation for high variation in over- instructions quote) are called that the general practitioner is of the opinion that the decision for orthodontic treatment should be made by a specialist and it was better, more likely to be transferred than to be later pulled from the parents accountable [29th]

Important factors may be different thresholds that result in an actual payment for orthodontic treatment as well as differences in the assess- Zung patient motivation of its employees, the expected oral hygiene and the financial situ ation of the patient. "On the other hand it could be that dentists low overgrazing sungsrate withheld treatment to orthodontists their patients or complicate treatment by a delay in payments" [29th]

Overall, it can be concluded from this study that the determination of the need for treatment and the question of the actual utilization of a treatment of numerous factors influenced seem. The question of assessing the need for treatment plays an important role - for the question of the actual supply but this is only one of several contributing factors.

6.5.6.3 Factors influencing treatment success

A number of factors seem to be crucial for achieving a therapeutic success. Orthodontic intervention as an isolated measure - as in randomized clinical trials researched - is only one component of a therapeutic success represents numerous factors such as the type and intensity of motivation and cooperation of the patient (compliance), time point of treatment, lifestyle issues (habits. , smoking, alcohol consumption, etc.), financial and social factors, side effects and comorbidities play a role.

Treatment success is partly assessed only in the long term in the case of orthodontic treatment, especially when the need for so-called retention measures (measures up quite preservation of acquired morphology) is given. Consequently, considering the succession is measures after the actual intervention to devote its own attention.

Single-phase versus two-phase treatment

Most orthodontic interventions begin with removable devices (early phase), followed by fixed appliances in the second phase, if necessary. In the case of a two-phase treatment these two phases can not be considered independently of each other in most cases.

On this subject the train researching no empirical study could be identified. Only an unsystematic literature related interpretation Author [95] dedicated to this subject and is essentially more unsystematic review articles, which in turn rely on evidence at the level of comments.

Early intervention

A study deals with the issue of early treatment (open bite). Early treatment is generally performed throughput for the most part with removable appliances. A systematic review on the basis of 1,049 identified items (period: 1966 to 2004) noted that under it was not a single randomized clinical trial. Seven studies could eventually be used on, but reported according to the authors [60] serious methodological problems (lack of power of the statistical methods used, distortion, bias, confounding, lack of failure analysis, lack of blinding and lack or misuse of statistical methods). The substantive analysis in this work show that it is quite possible to demonstrate success of orthodontic treatment and that it will be necessary in future to carry out further studies (especially high meaningful studies). Partly 100% success rate could be demonstrated - in three of the seven selected studies [60th]

A two-phase randomized controlled trial examining the significance of the first phase of treatment. The first stage was conducted with functional apparatus, the second phase with fixed appliances. It has been demonstrated that the first phase has no significant additive effect on the overall success [205th] It is concluded that early treatment must be regarded as much less efficient and that no subsequent treatment shortening in the second phase can be achieved with fixed appliances through this early action. These Class II patients, the one- and two-phase treatment were compared and therefore asked the meaning of the first phase in question [211 ..]

Timing of treatment

Robb et al. [191] investigated the efficacy and duration of orthodontic treatment between adolescents and adults. The aim was to investigate in this planned 72-person study whether the usual rumored opinion, according to which the treatment of adults is more difficult and requires a longer duration, can be maintained. As a clinical score of the PAR index was applied. On the basis of this study it was concluded that no statistically significant difference between adolescents and adults was found between adolescents and adults with prädominanter Class I malocclusion, and the extraction of four premolars. The number of broken and repaired equipment could resolve 46% of the variability of the treatment period and 24% of treatment effectiveness ER- [191st]

This study has been carried out on the basis of retrospective surveys. Due to the marked amount of variability PAR score and the duration of treatment, the study plan is incomprehensible, since the criterion for the equipment of study with appropriate power (indicated by 80%) can not be achieved in this way. The sample size of 21 per group (there were additional cases included) does not appear to be suitable for the determination of this question, since the validity of this retrospective, selected by non-randomized criteria cases of three experienced practicing orthodontist appears to be insufficient. In addition, methodological problems appear to be, for the analysis of count data (number of broken equipment, number of repairs using t-tests or multiple stepwise regression seems questionable, since the methodological conditions are unlikely to be met. The issue of timing is scientific in the current controversially discussed literature. While Black (quoted by Diedrich [74]) indicating that early treatment can be regarded as justified only in exceptional cases, reference is made in a review of the treatment planning in the 21st century on [62] that early initiation of treatment is always displayed.

Risk factors for therapeutic success

As already indicated, the therapeutic success is multifactorial. A study by Bergström et al. [27] pointing to a number of factors in the form of an influence diagram.

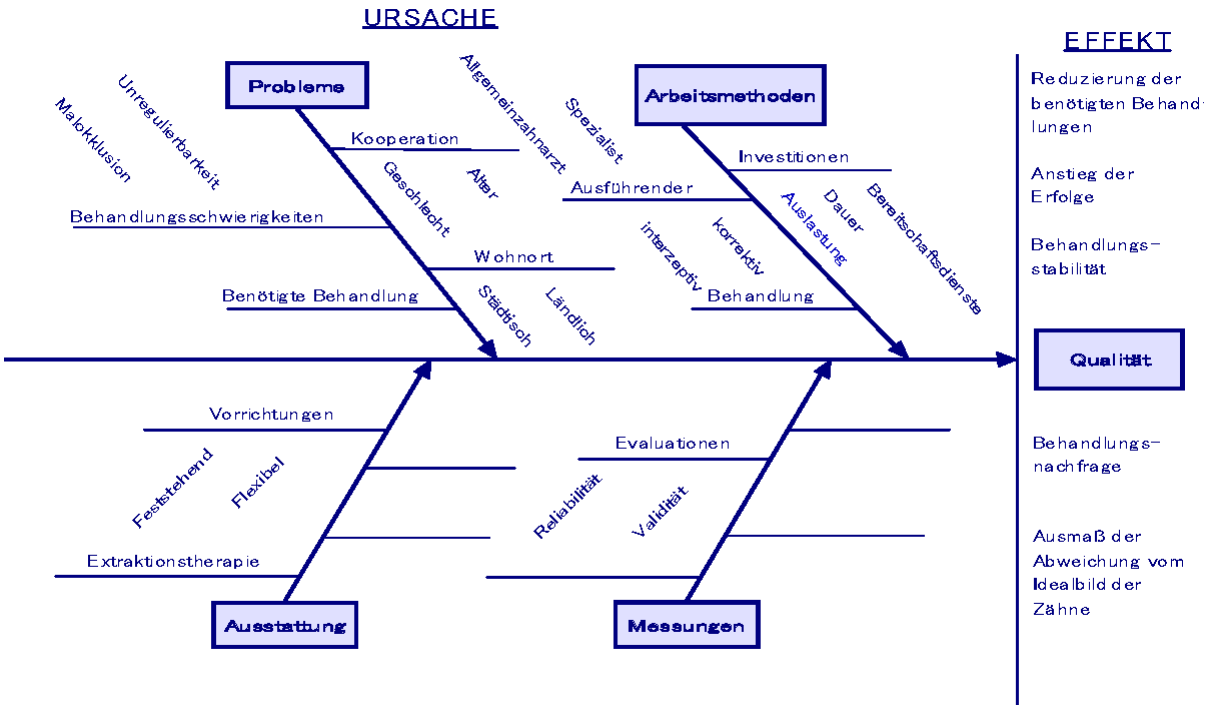

Figure 1: Factors that influence orthodontic measures

retention

As retention maintaining the therapeutic success is referred to. In the field of orthodontics, the long-term mechanical support may be required by means of so-called retainers. Fixed retainers are for. B. Twistflexretainer as lingual or Palatinalretainer or retainer with two bracket bases as splices [139th]

A non-systematic review article examined the stability of the retention [30th] By means of numerous references are the following factors as influencing factors on the sustainable preservation of main- orthodontic treatment supported:

- Change in arc shape
- Periodontal and Gingivitalgewebe
- Mandibular incisor dimensions
- Environmental factors (in the sense of muscle pressure) and neuromuscular
- Contemplation of body growth
- Post Therapeutic tooth position and functional occlusion
- Development of third molars
- Influence of the original Malokklusionsgründe
- treatment modality
    - Late extraction with subsequent full treatment
    - Serial extraction without treatment apparatus
    - Serial extraction with subsequent application apparatus
    - Not extraction with arch extension
    - Early mixed dentition without fixed appliances
    - Not extraction spacing with generalized
    - Extraction of the lower incisors.

Blake et al. [30] conclude that it is not necessary to comply with the basic requirement of a permanent retention measure in the treatment planning that is required by many authors. It is suggested which a principles-based approach in place to ensure a permanent retention, without having to use orthodontics (retainer).

In this paper, reference is made to a ten-year follow-up, in (on Little, Riedel quotes from Blake et al. [30]) referenced. According proved by all the investigated treatment methods, the mandibular "Spacing" than the one with the greatest long-term stability. This sub investigation fell into the category of non-extraction with generalized "Spacing". A ten-year follow-up, retention [7] showed that 67% of the achieved kieferortho- pädischen successes could be obtained even after ten years. Half of the failures (non-maintenance therapy successes) took place in the first two years. This work asks orthodontist real therapeutic success to communicate stronger.

Side effects, inflammatory events, demineralization, oral hygiene, in particular analysis of caries

To determine the risk of tooth decay in mind the epidemiological measure no study could be found that has applied at least shares or rates of occurrence of tooth decay compared to a control group. The risk is, therefore, indicated mathematically in any way, nor from secondary literature independently calculated.

A scientific article on the level of an author commentary [217] Note that the width of the gingiva, as measured from coronal to apical little influence on the formation of recessions during orthodontic treatment has. As far, however, the strength of the gingiva is considered. Therefore particularly tooth movements should be made in vestibuläroraler direction only after a thorough examination of the gingiva on the pressure side. As long as the tooth is moved within the alveolar tissue, the risk is lower. However, if the continuity of the

covering bone is at risk, the quality of the soft tissue still acts also after active movements. In addition, bacterial plaque have a negative impact on thin gingiva. In such cases, the patient has to operate a complete oral hygiene without damaging the gingiva [217th]

Measures to avoid unwanted side effects of orthodontic treatment, hygiene, fluoridation

To reduce demineralization around orthodontic appliances poor oral hygiene, long treatment periods and a bad patient cooperation are cited as problems. To prevent further damage, in Gorton et al. [102] set out, as might be encountered these processes. Here fluorinated cements are used. The angewen- Deten result parameters are solely chemical nature, however, it was possible to achieve a significant reduction of the melting defect due to caries around the brackets.

6.5.6.4 Measures with respect to the overall system of man

For the (sustainable) success of orthodontic measures apart from the isolated treatment effects of orthodontic intervention their environmental conditions and requirements to be regarded as success factors. These factors are so important that the success of a completely correct itself orthodontic treatment either directly or indirectly secured, extended risk can be up to almost impossible.

Orthodontic measure can not and must not be detached from the conditions existing Rahmenbe- be viewed by the human organism provides.

Impact on everyday life

More recently, attention to social, psychological, biological and functional effects of dental disease on daily life has been laid strengthened [156th] Based on this qualitative survey methods were applied to 30 patients, the extent to which fixed appliances on daily life influence. In this context, findings from preliminary studies were used to develop a corresponding detection instrument. The contained therein question categories that are considered essential are:

- aesthetics
- functional impairments
- Consequences on food
- Oral hygiene aspects
- Aspects of the continuation of the measures
- physical aspects
- social aspects
- Time required for the measures
- Travel / cost / inconvenience and its consequences.

This instrument has been tested theoretically investigated with the aim to use this detection instrument as a basis for further research questions [156th]

Measures and temporomandibular joint dysfunction

"Temporomandibular disorders (TMD) is a collective term for a variety of clinical problems which affect the muscles of mastication or the temporomandibular joint to the adjacent structures, or both. Although TMD was considered a single disease, current research supports the view that TMD representation, a group of related disorders of the masticatory system len that have many symptoms in common "(Henrikson [121] as well as in integrated secondary citations). The relationship between the measures and the occurrence of orthodontic TMJ functions is considered controversial total historically, in which a phase of the analysis of

claimed contexts is regarded as coincident or as an independent event is replaced by a phase (prior to 1985), in which this context is not seen. The literature of the last ten to twenty years, this relationship is negated essentially. Numerous reasons could suggest that this relationship has really changed by advances in diagnosis the advancement of technology orthodontics in the last twenty to forty years. A comprehensive review by McNamara [162] pointing to factors influencing the emergence of a TMD. Numerous factors appear with the occlusion itself to be related, but there is due to this non-systematic literature review did not indicate any increased risk share for TMD because orthodontic intervention. failure to achieve this goal not increased signs or symptoms of TMD - although obtaining a stable occlusion is a reasonable orthodontic goal manifests itself - according to statements made in this study.

McNamara has completed this review of the literature over time and comprehensive further published [163rd] In this work of 1997, the most significant studies are listed in a table, provided with a few characteristics (such as patient number, type of device) and assessed the importance of a link between orthodontic measures including extraction therapy and TMD. The conclusions of this work from 1997 are:

1) Signs and symptoms of TMD can occur in healthy individuals
2) Signs and symptoms of TMD to rise with age, especially in adults to NEN
3) Orthodontic in adulthood does not affect the risks (or opportunities) later TMD
4) The extraction therapy does not increase the risk of TMD
5) There is no evidence of an increased risk of TMD by orthodontic mechanics
6) Despite the aim of reaching a stable occlusion failure to achieve is not associated with an increase in the risk of TMD
7) There is a little evidence that orthodontic treatment of TMD can prevent and requires the study location further investigation.

A non-randomized controlled long-term study (duration: 15 to 18 years) with 50 patients 2005 [81] confirmed in full the conclusions of McNamara [162, 163,] according to which no accident can be seen connexion between orthodontics and TMD. A study of 65 Class II patients was of Henrikson [121] carried out. These were treated with orthodontic multiband appliances, 58 were untreated and 60 girls had a normal occlusion (normal group). In all three groups individual variations in the course of two or three-year study showed when data according to symptoms and signs of TMD. In the orthodontic group, the incidence of muscular signs of TMD was post- therapeutically lower. The class II and the normal group showed contrast, during the two years of little change. Although TMJ clicks increased in all three groups over the two years was less prevalent in the normal group. In the normal group, the symptoms and signs of TMD generally occurred less frequently than in the Orthodontie- or class II Group. In summary, the author draws [121] the conclusion that an orthodontic treatment, increases with or without extraction of teeth neither the risk for the subsequent development of signs of TMD, yet already deteriorated existing symptoms. In individuals with Class II anomalies and muscular signs of TMD, the situation over the observation period of two years seem away even more to improve [121st]

The same results are Dibbet et al. [73] in a combination of unsystematic literature review and a longitudinal study of 281 children.

Multidisciplinary of the therapeutic approach

myofunctional therapy

In the course of orthodontic treatment, the morphology of the bone and the position of the teeth are influenced by mechanical action. It can by Sergl and Zentner [198]

not be assumed that the basis of which automatically the surrounding soft tissue adapts to these new conditions. A study of 148 orthodontic patients who were examined for different assessment methods, leads Sergl and Zentner [198] to the conclusion that the myofunctional therapy must be required for orthodontic patients, as these can increase the success of an orthodontic treatment substantially. The myofunctional therapy also included motivational aspects of patient compliance for orthodontic measure considered psychosocial factors, promotes communication with the patient, to a stabilization desired Patientengewohn- could habits lead, strengthens the personal responsibility, promotes his self-control and prepares it for potential problems orthodontic measures. However, the evidence of the effect of this therapy is low and depends primarily on the ability of the therapist [198th]

Muscle Balance - muscle measurements

Because the objective of orthodontics, the teeth to bring in a better, more functional and more aesthetic relationship is the inclusion of the muscles after Mahony [153] too little attention. Muscle activity was initiated to measure for more than 50 years and now there are many devices available on the market that can realize the electromyography. If the Okklusalkräfte are unevenly distributed around the dental arch, a tooth movement will cease, leading to an endless procession of retainers to maintain the tooth positions. Nowadays it is possible, simultaneous and accurate measurement of the relative powers of each Okklusalkontakts to measure the timing of the Okklusalkontakts and the specific muscle contraction levels. This technological breakthrough is called a paradigm shift towards sustainable orthodontic stability [153rd]

6.5.6.5 Indications rules for orthodontic measure

have orthodontic measures, such as all the interventions criteria by which a judgment is made. These diagnostic measures are required, which also contribute to the success or the failure of an orthodontic intervention.

What diagnostic measures (surveying techniques, imaging techniques, models, etc) prove to the canon of several "schools" established as scientifically adequate? individual assessments are generally made for the issue of the need for treatment. It must be noted that no guidelines, no methods of standardization or limits were found as part of the overall research that could be relevant in the application of the treatment demand indices. Quite conversely, is emphasized in numerous sources, the individuality of each patient and considers this individual initial situation, combined with the clinical expertise of the practitioner as a basis for the actual taking of orthodontic treatment.

To answer the question, no indication as always hedged rules for the application of orthodontic treatment could be found. Simultaneously, the Angle classification, the patient needs and clinical assessment of the dentist, however, appear to be quite tough criteria by which a therapeutic decision could fall. However, these are made explicit in any way in the literature. However, it can not be concluded that the clinical decision is made with arbitrary, it is not transparent and subject to possible incentives.

Stepping up efforts to increase the transparency of clinical decisions have already been discussed in many places at certain points or required. Despite difficulties of standardization of treatment procedures, efforts should be made to develop the indication rules for the use of fixed appliances and the role of the function-oriented

to integrate thinking with. These approaches seem the broader topic of oral health in comparison to dental health pick.

6.5.6.6 Economy - Ethics

a) Economical

The economic component of orthodontic treatments seem to have much on the measures clinical decisions influence. An international comparison of assessments regarding the need for therapy and clinical decisions primarily in Europe [185] examined the variability in the assessment of scores had on a sample of 240 cases that are evaluated in parallel by all participating orthodontist. Numerous subscales for IOTN were applied. By statistical analysis of matches (Kappa values) were determined, the reliabilities of the estimates as well as factors that seem to affect this correspondence. Although interpretive inadequacies can in principle be argued upon this data in cross-sectional studies, both random variations in orthodontist in the case of repeated medical findings and found between orthodontists were. The decisions for or against a treatment appears to be systematically influenced by what was viewed as a function of market economy between the participating States and their financing. The extent of market participation in the clinical decision making is determined in a study between 24% and 48%. This degree of variability of professional assessment of the need for therapy raises to Richmond et al. [185] Questions on how orthodontic treatment can be justified and to what extent legal aspects are addressed here. It calls for a more reliable assessment of the therapeutic need for orthodontic intervention as it represents the individual professional opinion.

The assessments were strongly in agreement and 84% of clinical treatments could be explained by five occlusal measures or predicted. Why is the assessment of the need for treatment has moreover inexplicable (and probably motivated by financial considerations) variations is a conclusion, in which greater international investigation of the need for intervention is required. Patient compliance is just at

long-lasting treatments, as the

Orthodontic treatment is, of particular importance. In a model experiment for orthodontic treatment with a small sample of the insured could be demonstrated that a charging method, the responsibility stronger than the current to the Eigenverant- anknüpft of patients, significantly higher participation, as measured by success of treatment leads than in the reference group [116th]

The current practice described to the effect that the patient has to pay 20% co-payment each quarter, which will be refunded to him upon presentation of a successful conclusion of treatment, has been modified and linked with the refund in the assessment of compliance. Patients were provisionally exempted from co-payment, but they had to face at the end of orthodontic treatment a check-up of an independent Gutachers, the participation of the patient - assessed - if necessary in consultation with the attending dentist. Was the participation satisfactory, the patient was finally freed from the otherwise overdue payment in the amount of 20% of the treatment costs.

Changed billing procedures, which take into account indicators of treatment success should therefore increase patient compliance, as well - bring supply-side efficiency gains - considering reached levels of coverage and practiced indication behavior. Such performance-based billing method can act together with grant and Bonifizierungsregeln as elements redesigned Contracts for the insurance dental health risks [116th]

On the question of whether development needs for orthodontic treatment to a true treatment or is a luxury item, reference is made to the proving illness consequences of not complying with therapy [152nd] As a consequence, methods of screening for early detections of undesirable developments, as well as funding arrangements would have to make accordingly.

b) Ethical

Ethically, the question is examined whether there are studies showing the use of orthodontic treatment in which an intervention requirement as not reasonably assured. Are there measures that are unnecessary? Is the potential problem of supply-induced demand ethically problematic?

On these issues, no studies were found. The problem of unregulated high degree indication criteria paves the way for an entirely interpretive leeway that could be interpreted as a supply-induced demand. Because the treatment planning of orthodontic treatment is an individual planning is enhanced and a corresponding indication in their individuality, taking into account the now increased importance of psychosocial factors. The question of the meaning of standardization is to be interpreted in naturally individual and complex patterns intervention unlike standardized interventions as such. B. is the administration of a drug.

7 discussion

Orthodontics is a discipline of dentistry, which has to deal with the individual treatment planning of patients. Individual treatment planning includes both the field of diagnostic nose and their individual and patient-related characteristics, such as the selection from a large number of possible fixed appliances. Consequently, the analysis of the effectiveness from the viewpoint of therapeutic settings can be seen and assistance on a non-standard measure. Therefore, no limits, absolute standards or criteria are de- finierbar to lay doubt it measures close.

The scientific substantiation of orthodontic treatment with fixed rates on apparatus is extremely low. None of the questions in this report can be answered, only be approaching with a satisfactory clarity, even if softer types of studies, such as non-randomized or retrospective studies are included. Of course, the scientific testing of non-standardized interventions of a challenge (therapeutic setting). However, it is basically a demand from a scientific and ethical point of view that interventions on human beings also require appropriate protection. Similarly, payers of interventions can expect a certain level of assurance as to the success, as well as the consent of the patient for therapy by egg nem secure knowledge as well as a sound prediction of the practitioner must be built. On the other hand no doubt is to cherish, that the use of fixed rates on apparatus is very effective if used in isolation. Hundreds of thousands of successful orthodontic patients treated with great satisfaction certainly bear witness that here very professional intervention with a considerable diagnostic effort be carried out. There is an impression that in this area a large gap between the practical application and scientific research into the effectiveness of orthodontic measures took exists. There is much research in the field of diagnostics and development of equipment and techniques, but very little in the area of need for intervention, analysis of sustainability factors influencing the success or quantification of side effects such. B. caries or root resorption.

The issue of oral health in relation to dental health is not mentioned in any way nor scientifically. the role of the now observable trend toward functional oriented approach or the multidisciplinary approach Nor is sufficiently scientifically discussed. The revision of risk measures or indexes that show a need for treatment up towards the avoidance of expectable individual complications appear to be the next scientific step required. These ways of thinking also The required clarification of the role of industrially planned treatment processes is addressed. Recycling offerings are enjoying great popularity in practice, however, the question of the scientific evidence does not yet appear to be sufficiently publicized.

Although the effectiveness of interventions due to their obviousness not require further exploration (eg. As the surgical removal of a finger is effective here is not the study programs needed), as though the question of indications must (when is the surgical removal of a finger required scientifically studied) and be justifiable. Research to evaluate the indications for use of fixed appliances is completely lacking, as well as the necessary evaluation parameters (eg. As a medium to long-term preservation of teeth) have not been sufficiently explored, let alone the oral health.

This gap is cause for concern inasmuch as it is given assurance systems in Central European financing due to the health economic coupling of identification of needs (demand creation) and service delivery. This opens up a framework for the creation of a possible so-called supply-induced demand.

In order not to bring the professional work of Orthodontics in the nearby area of demand creation or unnecessary indications, research of this topic is essential. The derliche require much stronger protection of indication criteria for the safety of demarcation to not medically justify services could bring significant contributions to the trust of patients or insurance companies. Existing for intervention hedge indices, such IOTN seem to have academic significance that appear virtually meaningless in practice services.

8th Conclusion / Recommendation

The oral health is relatively new and it is only a few years ago that we had the first definitions on this. Care must be taken to the interdisciplinary approach to the problem. While the technical implementation of the orthodontic treatment in the focus of interest, the functional relationship of the orofacial region must not be ignored.

The cooperation of the patient appears for the functioning of this intervention is also important as the consideration of oral functions, such as chewing, swallowing, hygiene, muscle activity and forces balance.

The oral health, however, following the weak evidence far-reaching systemic consequences for health, like other systemic, eg. B. gastrointestinal diseases. The question which indications can now apply hedged for intervention as scientific attention must be paid immediately. The individual and subjective assessment of the practitioner (whose experience is not in doubt) is not sufficient to assess the performance of orthodontic treatment as well. The use of fixed appliances in correcting misaligned teeth requires a significantly better clarified scientific environment. This includes the issue of expansion of tooth on oral health, the integration of the role of the patient, the possibilities and limitations of function-oriented approach and possibly interdisciplinary view of the oral cavity. The reasoning through scientifically well-supported studies should be required absolute, the patient from an ethical, the social security system from a financial and ultimately also the dentist from evaluative and legitimating reasons. Coordinated research project to evaluate the use of fixed appliances that are pursuing the goal of targeted data collection in the context of appropriate experimental plans for individual therapeutic processes urgently needed. The role and compliance of the patient whose employees required to obtain the therapeutic success appear to be too little researched. The success factors for a long-term preservation of teeth or a function-oriented and oral health have been discharged from numerous publications zusammenge-. There is no single identified literature source that takes up such a topic. Such research emerge from scientific, but especially for the sake of securing the success of the application of fixed appliances essential since so great contributions to increase transparency, their application in practice and the traceability of financial expenses in the sense of cost / benefit considerations can be expected.

The study quality is a major issue. It is unacceptable in the 21st century in the context of evidence-based medicine, the methods generally known location and the tight financial viability of the health system to publish methodical completely unusable or afflicted with many obvious mistakes studies. Orthodontics and in particular the use of fixed appliances, which increased applications delighted deserves also go as a correspondingly high-quality scientific support and secure its advantages in view of the likely suspected rightly successes.

A scientifically improved protection of therapeutically necessary interventions to prevent late complications could also provide contributions to the extent to which remedy a malposition is a medically meet final measure, one by other considerations (eg. As socially necessary measure) motivated action or simply a luxury good is , could indicate that it is in the application of fixed appliances also about the comparison of better oral health, the health of the people in general and preventing many late complications go should definitely be pursued in the form of studies.

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10.1 Keywords

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10.2 databases

These databases were researched: DAHTA DAHTA

database		Federal Ministry of Health
INAHTA NHS CRD HTA		NHS CRD 2004
NHSEED NHSEED		NHS EED 2003
CDAR94 NHS CRD DARE		Cochrane
CDSR93 Cochrane Library - CDSR		Cochrane
ME90	MEDLINE	NLM
EM90	EMBASE	2006 Elsevier BV
CB85	AMED	THE BRITISH LIBRARY 2003
BA90	BIOSIS previews	Thomson Scientific
MK77	MEDIKAT	ZB MED
CCTR93 Cochrane Library - Central		Cochrane
GA03	gms	gms
SM78	SOMED	IÖGD 2002
CV72	CAB Abstracts	CAB
II78	ISTPB + ISTP / ISSHP	Thomson Scientific
ED93	ETHMED	IDEM 2005
AZ72	GLOBAL Health	CAB
AR96	German medical journal	DAEB
ME0A	MEDLINE Alert	NLM
EA08	EMBASE Alert	2005 Elsevier BV
IS90	SciSearch	Thomson Scientific 2003
CC00	CCMed	ZB MED
KR03	Karger Publishers database	Karger Publishers
KL97	Kluwer publishing database	Kluwer Academic Publishers
SP97	Springer-Verlag database	Springer-Verlag
SPPP	Springer-Verlag database preprint	Springer-Verlag
TV01	Thieme-Verlag database	Thieme-Verlag

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economics in the German Healthcare established.

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