Orthodontics

Treatment plan

Treatment planning is the most complex area in orthodontics. In order to formulate an appropriate treatment plan the clinician needs to be competent in history taking, examination of the patient, and collection of appropriate records. The clinician also needs to have an understanding of growth and development, facial and dental aesthetics, occlusion, aetiology of malocclusion, different orthodontic appliances and mechanics, the physiology of tooth movement, the risks and benefits of treatment, retention, and relapse. It involves producing a road map of each step to be executed sequentially for a particular case so as to achieve the desired results.

✓ General Objectives of orthodontic treatment

When planning treatment, the following areas need to be considered:

• Aesthetics.

• Oral health.

• Function.

• Stability.

Ideally, orthodontic treatment should:

1) Ensure a good aesthetic result, both facially and dentally.

2) Promote good function; and produce as stable results as possible.

Treatment should never compromise dental health or function, but occasionally, it may not be possible to produce a treatment plan that creates ideal aesthetics and the most stable result. In these cases, a compromise may need to be reached and this must be discussed with the patient as part of the consent process, explaining the limited treatment objectives.

✓ **Forming an orthodontic problem list**

By following a logical process, the clinician can draw up a problem list that will help to provide the information needed to form the treatment plan. This process is shown in the figure below.

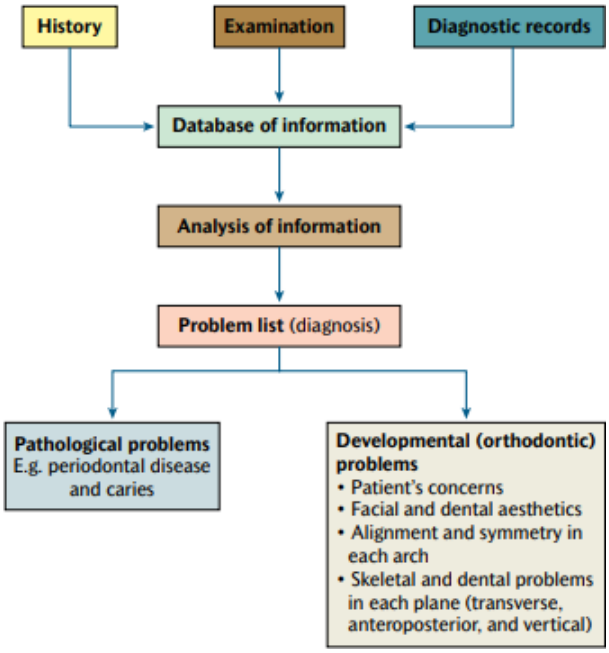

Figure: Problem list flowchart (Mitchell and Littlewood 2019).

The history, examination, and collection of appropriate records are required to identify the problems in any case. This list of problems helps to formulate a diagnosis. Problems can be divided into pathological problems and developmental problems. Pathological problems are problems related to disease, such as caries and periodontal disease, and need to be addressed before any orthodontic treatment is undertaken. Developmental problems are those factors related to the malocclusion and make up the orthodontic problem list.

- In order to make this problem list more understandable, it can be classified into these sections:

1- The patient's concerns

The patient's role in orthodontic treatment success is vital.

The following areas need to be considered:

- Patient's concerns
- Patient's expectations
- Patient's motivation.

A patient will only be satisfied if those aspects of their malocclusion which trouble them are addressed. An appropriate history should reveal which features they are unhappy with and importantly, the result they are hoping for, or expect, at the end of treatment. Where possible, the clinician should formulate a plan that addresses the patient's area of complaint. However, occasionally the patient's perception of their problem or expectations may be unrealistic.

The role of the orthodontist is then to counsel the patient carefully to explain what can or cannot be achieved. If the patient's expectations are unrealistic, then treatment should not be undertaken. It is also often helpful for the orthodontist to explainto the patient the parts of the occlusion which are normal and that are therefore not going to be changed. Undergoing orthodontics requires a great deal of active participation and cooperation from the patient. No matter how skillful the orthodontist, treatment will not succeed unless the patient is sufficiently motivated to cooperate with all aspects of their orthodontic care. If the patient is not sufficiently motivated, then treatment should not be undertaken.

2- Facial and smile aesthetics

Straight teeth do not necessarily create a good smile and appropriate facial aesthetics. The position of the teeth within the face, and the effects of tooth movements on the overlying soft tissues of the lips, need to be considered. This is a complex area for a number of reasons. The perception of facial aesthetics is affected by personal and cultural factors and also by fashions and trends. There has been a recent trend towards more protrusive profiles, with proclination of both the upper and lower dentitions to produce more lip support. Advocates suggest that this treatment approach leads to increased lip protrusion and can produce a more youthful appearance, but it does come with some potential risks.

Firstly, proclination of incisors may move the teeth into areas of increased instability, with a tendency for the lips and cheeks to push the teeth back and cause relapse. In addition, over expansion and proclination may lead to teeth perforating the buccal plate, causing bony dehiscences and possibly compromising future periodontal health. It is also important for patients to understand that excessive protrusion of the dentition can produce an unaesthetic result. The effect of tooth movement on the overlying soft tissues is unpredictable. It is untrue to suggest that extracting teeth and retroclining the upper incisors will automatically compromise the facial aesthetics. However, care must be taken in cases where excessive retroclination of the upper labial segment is being considered, to avoid flattening of the facial profile. This would be particularly contraindicated in patients with an increased nasolabial angle, large nose, and retrognathic mandible as explained in the figure below.

Figure: Consideration of facial aesthetics in orthodontic treatment planning. Patient presented with a markedly increased overjet of 12 mm. Although the patient complained about the prominent upper teeth, a large proportion of the problem is the retrognathic mandible. Simply retracting the upper labial segment would reduce the overjet, but this would have an unfavourable effect on the facial profile. The soft tissue response to dental movement is unpredictable, but in this case, with such a large dental movement required and the retrognathic mandible, reducing the overjet by reduction of the incisors alone would unfavourably flatten the facial profile (Mitchell and Littlewood 2019).

3- Alignment and symmetry in each arch

The amount of crowding or spacing in each arch needs to be assessed, as well as the inclination of the upper and lower incisors and any tooth size discrepancies identified. This will play a major role in assessing the amount of spacerequired to treat the case. The process of determining the amount of space required is called ‘space analysis’. The shape and symmetry within each arch is also noted.

4- Skeletal and dental relationships in all three dimensions

The aim is to describe the occlusion, distinguishing between the dental and skeletal factors contributing to the malocclusion in each plane. Generally, it is easier to correct malocclusions that are due to dental problems alone—if there are underlying skeletal problems, these are often more difficult to treat.

- ✓ **Basic principles in orthodontic treatment planning**

Once the aims of treatment have been established, treatment planning can begin. The basic principles are discussed below.

1- Oral health

The first part of any orthodontic treatment plan is to establish and maintain good oral health. While definitive restorations, such as crowns and bridges, may be placed after alignment of the teeth, all active disease must be fully treated before beginning any orthodontic treatment.

2- The lower arch

Traditionally, treatment planning has been based around the lower labial segment. Once the position of the lower labial segment is determined, the rest of the occlusion can be planned around this. In most cases it is advisable to maintain the current position of the lower labial segment. This is because the lower labial segment is positioned in an area of relative stability between the tongue lingually, and the lips and cheeks labially and buccally. Any excessive movement of the lower labial segment would increase the risk of relapse. Treatment planning around the lower

incisor position is less rigidly adhered to in contemporary orthodontic treatment planning, due to the increasing emphasis on facial and soft tissue aesthetics.

3- The upper arch

The upper arch should be positioned within the face to provide the best facial and dental aesthetic result, within the confines of the existing skeletal and soft tissue environment. The secret to achieving a Class I incisor relationship is to get the canines into a Class I relationship. It is helpful to anticipate the position of the lower canine once the lower labial segment has been aligned and positioned appropriately. It is then possible to mentally reposition the maxillary canine so that it is in a Class I relationship with the lower canine. This gives the clinician an idea of how much space will be required and how far the upper canine will need to be moved. This will also give an indication of the type of movement and therefore type of appliance required, as well as providing information about anchorage requirements.

4- Buccal segments

Although the aim is usually to obtain a Class I canine relationship, it is not necessary to always have a Class I molar relationship. If teeth are extracted in the upper arch, but not in the lower, the molars will be in a Class II relationship. Conversely, if teeth are extracted in the lower arch but not in the upper, the molars will be in a Class III relationship. Whether extractions are needed or not will depend upon the space requirement in each arch. Typically, extractions are more likely to be needed in the upper arch in Class II cases, to allow retraction of the upper labial segment to camouflage the underlying skeletal pattern. However, in Class III cases treated orthodontically, extractions are more likely in the lower arch to allow retroclination of the lower labial segment.

5- Anchorage

Anchorage planning is about resisting unwanted tooth movement. Whenever teeth are moved, there is always an equal and opposite reaction. This means that when teeth are moved there is often a side effect of unwanted tooth movement of other teeth in the arch. When planning a case, it is therefore important to decide how to limit the movement of teeth that do not need to move. It is vital that anchorage is understood

Factors affecting the choice of a specific treatment plan

The final treatment plan is the result of a discussion between the patient and the orthodontist. It is designed keeping in mind the priorities given to the various problems in the problem list. The choice of a specific treatment plan is based upon:

1- THE TYPE OF TOOTH MOVEMENTS REQUIRED

Simple tipping movements can be achieved using removable appliances. If multiple, complex tooth movements are desired, it is advisable to use one of the available fixed orthodontic appliances.

2- PATIENT'S EXPECTATIONS

Patients who have high expectations are expecting ideal finishes which might not be possible using removable appliances. Such patients are concerned about their esthetics to such an extent that the labial appliances might not be an option, they might desire the use of lingual appliances or ceramic appliances.

A compromise might need to be arrived at regarding treatment results and thepatient's expectations, it is advised to inform the patient exactly what is achievable with which appliance, to the best of the clinician's ability before commencing the treatment.

3- GROWTH POTENTIAL OF THE PATIENT

Growing patients can be considered as advantage or disadvantage. Results achieved during growth are more stable yet sometimes the return of un-favorable growth pattern following completion of treatment can result in relapse of the treatment results. This is especially true for Class III skeletal pattern cases. Sufficient planning and follow up is advised in growing patients.

4- PATIENT'S ABILITY TO MAINTAIN ORAL HYGIENE

Certain age groups or patients might not be able to maintain adequate oral hygiene with fixed appliance therapy.

Such patients can be treated using removable appliances with compromised treatment results.

5-THE COST OF THE TREATMENT

Fixed orthodontic treatment is more costly as compared to removable appliance therapy. Sometimes the patient might not be able to afford costly yet ideal treatment plans. The financial implications of the treatment should be considered and explained to the patient at the time of deciding upon a particular treatment plan.

6-THE SKILLS OF THE TREATING CLINICIAN

A- It is always better to work within your means and to present treatment plans that can be achieved. It is not possible for every clinician to be good at everything he/she does. Being truthful to the patient before treatment is better than being sorry for him/her following treatment.

B- It is the duty of the clinician to choose an appliance that is appropriate for the particular case and not just appropriate for the clinician. If one has to continue to treat cases, the clinicians need to upgrade their knowledge and skills with the change in developing technology.

7- DISCUSSION WITH THE PATIENT AND PATIENT CONSENT

Patient today act as co-decision makers. Hence, it is the orthodontist legal and moral duty to discuss the risk/benefit of the treatment and alternatives as well as the risks of no treatment at all.

Informed consent

Informed consent: means the patient is given information to help them to understand the:

- Malocclusion
- Proposed treatment and alternatives
- Commitment required
- Duration of treatment
- Cost implications

Treatment alternatives, which must always include no treatment as an option, must be clearly explained, with the risks and benefits of each approach carefully discussed.

Patients who are 16 years or older are presumed to have competence to give consent for themselves. Many orthodontic patients are younger than this, but provided that they fully understand the process, they can give consent. If a competent child consents to treatment, a parent cannot override this decision – this is known as ‘Gillick competence’. However, it is preferable to have full parental support for the treatment if possible. If the converse occurs – the parent wants the treatment, but the child does not – then it is best not to proceed. Orthodontic treatment requires a great deal of compliance, and unless the patient is totally committed, it is best to delay until such time as they are.

It is advisable to obtain a written consent for the treatment. A copy should be given to the patient with clear details of the:

1- Aims of the treatment,
2- Risks and benefits,
3- Types of appliances to be used,
4- Details of any teeth to be extracted,
5- Commitment required,
6- Likely duration of treatment

Note: When estimating treatment time, it is always better to slightly overestimate the likely treatment duration. If the treatment is completed quicker than first promised, the patient will be pleased. However, if the treatment takes longer, the patient may lose interest, resulting in compliance problems.

7- Any financial implications,

8- As well as long-term retention requirements.

As well as providing a written record of the aims of the treatment and the treatment plan, it is useful to give the patient a summary of exactly what is expected from them, this involves information about:

1- Maintenance of good oral hygiene.

2- Appropriate diet and regular attendance.

3- Also any specific requirements relevant to their case, such as headgear wear, turning expansion screws and elastic wear. A fully prepared and committed patient is more likely to result in more successful orthodontic treatment.

Orthodontic treatment plan phases:

1- Preventive Orthodontics

2- Interceptive Orthodontics

3-Corrective Orthodontics

- ✓ **Preventive Orthodontics**: Includes all those procedures undertaken to preserve the integrity of normally developing occlusion by protecting current conditions or preventing situations that would interfere with growth by the following measures:

1- Parent education:

A- Should ideally begin much before the birth of the child. The expecting mother should be educated on matters such as nutrition to provide an ideal environmentfor the developing fetus.

B- Soon after the birth, the mother should be educated on proper nursing and care of the child. In case the child is being bottle fed, the other is advised on the use of

physiologic nipple (designed to permit suckling of milk, which more or less resembles normal functional activity as in breastfeeding) and not the conventional nipple.

C- The parents should also be educated on the need for maintaining good oral hygiene of the child's oral cavity (avoid nursing during all the night)

2- Maintenance of shedding and eruption timetable.

3 -Management of premature loss of deciduous teeth.

4- Management of ankylosis of deciduous teeth.

5- Prolonged retention of deciduous teeth.

6- Extraction of Supernumerary Teeth.

7- Management of Oral Habits.

8- Management of deeply locked first permanent molars.

Occasionally, the first permanent molar may get deeply locked under the crest of contour of the distal surface of deciduous second molar due to distal inclination of the latter tooth.

To Prevent that: Re approximation /proximal stripping to a certain extent on mesial and distal surface of second deciduous molar will guide the eruption of deeply locked first permanent molar.

9-Treatment of Occlusal Prematurities:

Occlusal prematurities due to over or underfilled restoration or uneven attrition of teeth causes a tendency of forward placement of mandible. This may lead to pseudoclass III malocclusion.

To Prevent that:

a- Correcting the improper restoration. b- Treatment of attrition by composite restoration.

10- Management of Abnormal Frenum Attachment.

11- Space maintainers.

- ✓ **Interceptive Orthodontics:**

Interceptive orthodontics is undertaken at a time when malocclusion has already developed or developing. The difference between preventive and interceptive orthodontics lies in the timing of the services rendered. Preventive orthodontic procedures are undertaken when the dentition and occlusion are perfectly normal, while the interceptive procedures are carried out when signs and symptoms of a developing malocclusion are evident.

Interceptive orthodontic procedures may include:

1- **Serial extraction/guidance of occlusion**:

2- **Correction of developing cross-bites**

3- **Control of abnormal oral habits**: Correction of deleterious oral habits, such as:

a- Thumb sucking. b- Tongue thrusting. c- Mouth breathing.

4- **Proximal stripping of deciduous teeth to facilitate the eruption of adjacent permanent teeth.**

6- Interception of skeletal mal-relations.

7- Space regaining:

8- Muscle exercises:

Dentoalveolar structures are surrounded on sides by the soft tissue envelop made of orofacial musculature. Development and maintenance of normal occlusion depends on presence of normal oro-facial muscular balance. Muscle exercises help in improving aberrant muscle activity.

9- Removal of soft tissue and bony barriers:

Removal of soft tissue and bony barrier is a surgical interceptive orthodontic procedure, which involves excision of the soft tissue and removal of bone, covering the crown of the unerupted. Tooth, to create the space so that the tooth can erupt without any hindrance.

The extent of soft tissue and bone removal should be such that the greatestdiameter of the crown of the tooth should be able to easily emerge. The surgical wound is given a cement dressing for a period of two weeks.

Corrective treatment will be discussed later.

Bibliography:

1) An Introduction to Orthodontics. Simon Littlewood and Laura Mitchell, 5th edition, 2019.

2) Orthodontics: Principles and Practice. BasavaraJ S. Phulari, 2nd edition, 2017.

Good Luck