

Dental Surveying

Surveying: - is the analysis and comparison of the prominence of intraoral contours associated with the fabrication of the removable partial denture (RPD).

The primary purpose of surveying is to identify the modifications of tooth surfaces that are necessary for placement of component parts of RPD in their designated ideal position.

Dental surveyor: - it's a paralleling instrument used in the construction of R.P.D to locate and delineate the contour and relative positions of abutments and associated structures. It is an instrument used to determine the relative parallelism of 2 or more surfaces of the teeth or other parts of the cast of a dental arch.



Types of dental surveyors :-

We have 2 types of dental surveyor:


1. Electronic surveyor: they are complicated and expensive. Their use is restricted to researches and large commercial dental laboratories.
2. Mechanical surveyor : which includes
 - a- Ney surveyor (fixed arm).
 - b- Jelenko surveyor (removable arm).
 - c- Williams surveyor.

Prosthodontics

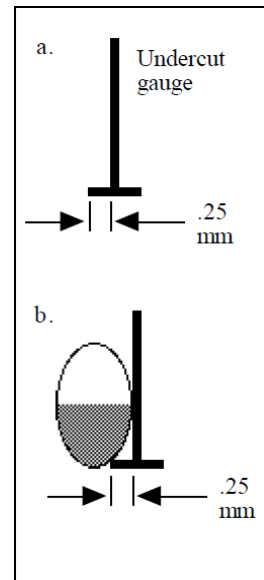
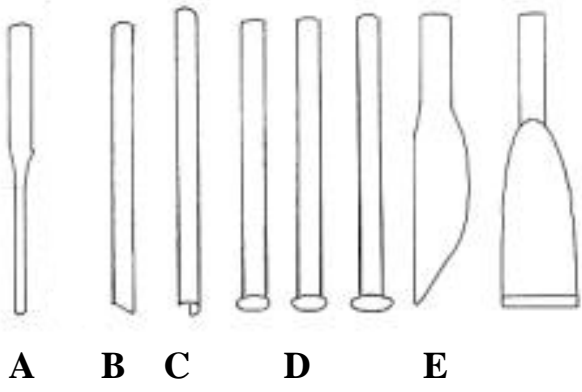
Mechanical surveyors are relatively inexpensive and easy to use. Although these surveyors have slight construction differences, they are basically the same and are used in a similar manner to produce identical results.

The most widely used surveyors are the Ney and the Jelenko surveyors. They differ principally in that the Jelenko horizontal arm swivels to permit freedom movement of the arm in a horizontal plane rather than to depend entirely on the horizontal movement of the cast, where as the Ney horizontal arm is fixed and depends entirely on the horizontal movement of the cast. The technique for surveying and trimming blockout is therefore somewhat different. Under cut gauge of Jelenko is of special type which has 3 sizes in the same rod while in Ney, there are 3 separate sizes of undercut gauge

Parts of dental surveyor:-

- 1- Platform (stand base): on which surveyor table moves.
- 2- Vertical arm: which is attached to the platform at one end and supports the horizontal arm at the other end.
- 3- Horizontal arm: from which, the vertical spindle is suspended.
- 4- Vertical spindle: it moves vertically upward and downward at right angle to the platform. It can be fixed at desired height by a tightening screw. The lower end of the spindle contains a tool holder.
- 5- Tool holder: It contains a tightening screw to fix various surveying tools in position.
- 6- Surveying table: which consists from:
 - a. Cast holder
 - b. Table base : which rests on the platform
 - c. Ball joint: which allows the cast holder to rotate into various positions in relation to the table base.
- 7- Tools of surveying. In a sequential order according to use are:-
 - A- Analyzing rod: It is a parallel sided metal rod used for preliminary survey of the casts without marking the cast.
 - B- Carbon Marker: it is a parallel sided carbon rod used for drawing survey line on the cast. When surveying a tooth, the tip of the marker should be level with the gingival margin allowing the side of the marker to produce the survey line as shown in the illustration.
 - C- Protective sheath: It is a metal sheath used with carbon marker to protect it from fracture.
 - D- Undercut gauges: it is a parallel sided metal rod with heads of specific sizes (0.25mm, 0.5mm, and 0.75mm). it is used to measure the depth of desirable undercuts on abutment teeth for correct placement of the clasp retentive tip. The shaft touches the tooth at its (survey line), while the head touches the tooth at an undercut depth equal to the size of the gauge used at the free gingival margin.
 - E- Trimming knife: used to trim excess wax that is used to block out the undesirable undercuts, to prepare guiding planes parallel to each other and to the predetermined path of insertion.

Prostodontics



Prosthodontics

Survey line: a line produced on a cast by a surveyor marking the greatest prominence of contour in relation to the planned path of insertion of a restoration.

If the analyzing rod comes in contact with the convex tooth surface, it will contact the maximum convexity of the tooth. Rotating the tooth around the carbon marker results in drawing a line denoting the height of contour of the tooth (survey line). If the tooth is tilted on the survey, another line will be drawn representing the survey line in relation to the new tilt. Therefore changing the tilt of the cast results in changing the survey line on teeth.



Changing the tilt results in changing the survey line.

The area of the tooth above the survey line is a non undercut area, while that below, is an undercut area. The location and extent of these areas can be varied according to the anterior and posterior, also the side to side tilt of the cast. Deciding the cast tilt mainly depends on the path of insertion. Anterior tilt is sometimes preferred in distal extension bases to increase resistance to vertical displacement of the denture by using undercuts distal to abutment teeth.

The significance of the survey line is that all rigid components of the prosthesis must be placed occlusal to this line, only the terminal retentive clasp tip is placed gingival to it.

Undercuts

An UNDERCUT is the portion of the surface of an object that is below the height of contour in relation to the path of placement

A partially edentulous mouth has many undercut areas which results from:-

- 1-The naturally bulbous shape of the crown of teeth.
- 2-Long axes of the teeth are frequently inclined at an angle rather than vertical to occlusal plane.
- 3-Soft tissues and underlying bone being inclined at an angle rather than vertical to occlusal plane.
- 4- Proliferation of soft tissues covering the edentulous ridge due to the rapid pattern of bone resorption

An undercut is the part of a tooth or cast surface cervical to the survey line (height of contour) AT THE SELECTED PATH OF INSERTION of the denture (TILT OF THE CAST). If the tilt of the cast is changed (changing the path of insertion of the denture) the depth of the undercut will change.

Prosthodontics

Types of undercuts:

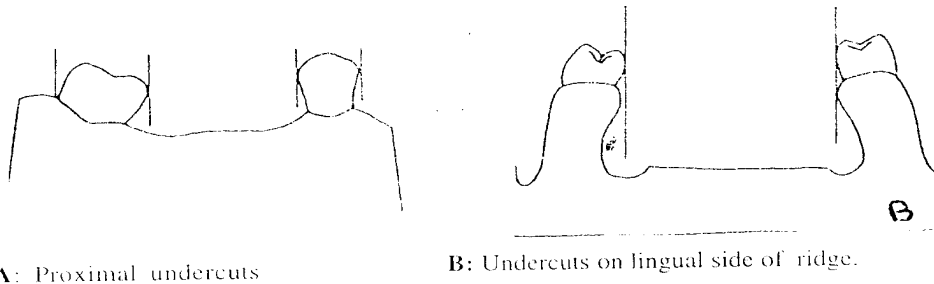
1) *Desirable undercuts:*

Desirable undercuts are used for retaining the partial denture against dislodging forces usually by using retentive flexible clasp arms, less frequently by the denture base engaging a tissue or bony undercut. They are mostly located on the facial or lingual surfaces of abutment teeth

2) *Undesirable undercuts:*

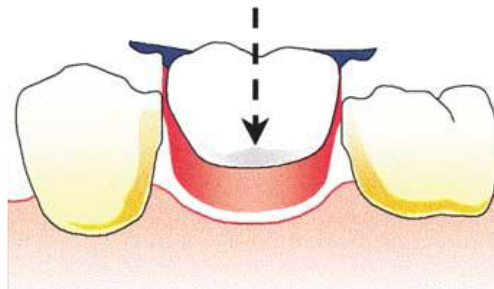
Undercuts other than those used for retention are considered undesirable and should be eliminated.

This is done by blocking-out the undercut with wax on the master cast, by the preparation and reduction of the tooth surface in the mouth or by placing a properly contoured artificial crown on the tooth.



Path of insertion: is the direction in which a RPD moves from the point of initial contact with the supporting teeth to the terminal resting position where occlusal rests are seated and the denture base is in contact with the tissues.

Path of removal: is the reverse of path of insertion.



The path of insertion and removal of the partial denture is determined by analyzing the cast placed on the cast holder in relation to the vertical rod of the surveyor. The vertical movement of the analyzing rod represents the path of insertion. The path of insertion changes by changing the tilt of the cast in relation to the vertical spindle.

Factors Affecting Path of Insertion (the degree of tilt):

The choice of the best possible path of insertion should consider the following factors:

1- Interferences:

The prosthesis must be designed to be inserted and removed without encountering tooth or tissue interferences. Such interferences resulting from inclined teeth, tissue or ridge undercuts tori or bony exostosis, could be avoided by either:

Prosthodontics

- Changing the path of insertion.
- Contouring the tooth surface (reshaping or crowning).
- Surgery to remove interfering structures as bony exostosis, tori or undercuts.

For example, if a bony undercut is present labially, insertion of a flanged denture along a path at right angles to the occlusal plane will only be possible if the flange stands away from the mucosa or is finished short of the undercut area. This can result in poor retention as well as a poor appearance (Fig A).

If the cast is given a posterior tilt so that the rod, and thus the path of insertion, is parallel to the labial surface of the ridge it is possible to insert a flange that fits the ridge accurately (Fig B).

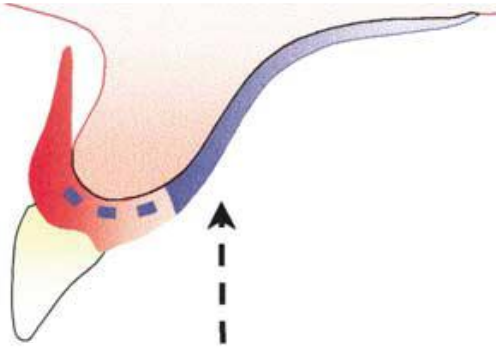


Fig. A

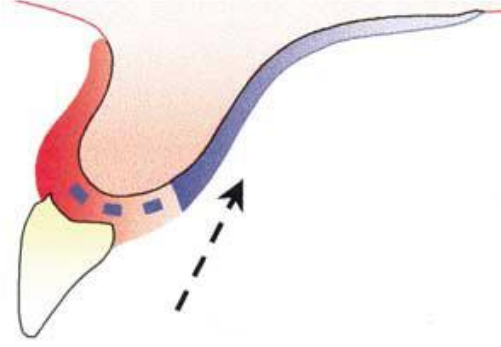
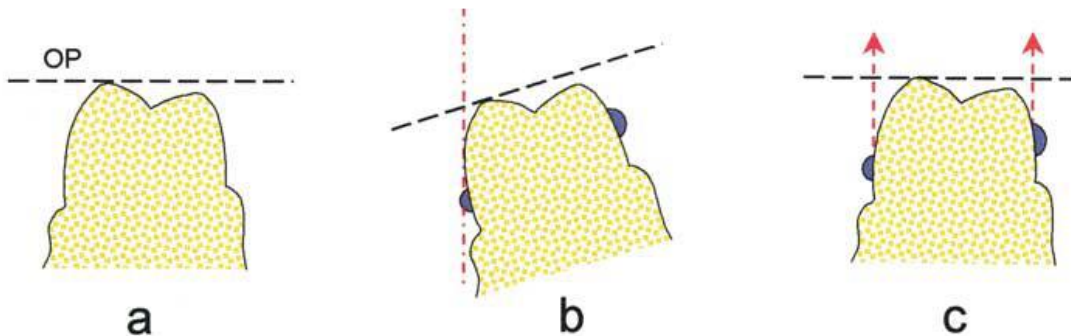


Fig. B

2-Retention:

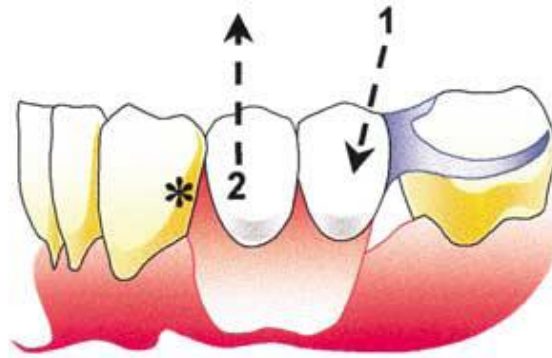
To obtain retention, undercuts must be present on teeth relative to the horizontal survey. It is a misconception to believe that changing the tilt of the cast will produce retentive undercuts if none exist when the cast is horizontal.



- a) No undercuts on the tooth when the occlusal plane (OP) is horizontal.
- b) An apparent undercut created by tilting the cast laterally.
- c) Clasp arms placed in this false undercut do not provide any resistance to movement along the path of displacement.

The principle of tilting the cast to enhance retention is by altering the path of insertion⁽¹⁾, a rigid part of the denture can enter an area of the tooth surface or an area of the ridge which is undercut relative to the path of displacement⁽²⁾. e.g. in Fig., providing retention by engaging the distal undercut (*) of the canine may well look more pleasing than a clasp arm on the same tooth.

Prosthodontics



3- Appearance:

Esthetic appearance can be considerably improved especially with anterior abutments by trying different paths of insertion. e.g. when a maxillary cast, containing an anterior edentulous area, is surveyed with the occlusal plane horizontal it will often be found that there are undercuts on the mesial aspects of the abutment teeth. If the RPD is constructed with this vertical path of insertion there will be an unsightly gap between the denture saddle and the abutment teeth gingival to the contact point (Fig A).

This unsightly gap can be avoided by giving the cast a posterior tilt so that the analyzing rod is parallel with the mesiolabial surface of the abutment tooth (Fig B, C).



Fig. A



Fig. B

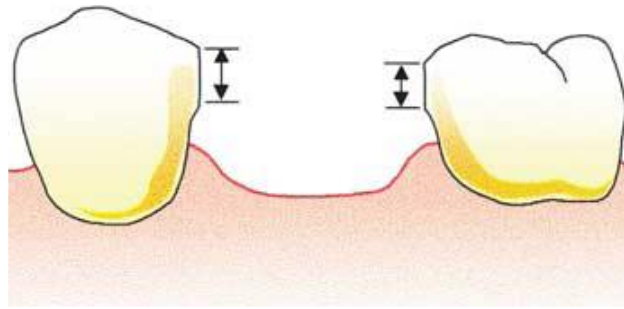


Fig. C

4- Guiding planes:

Two or more parallel axial surfaces on abutment teeth which can be used to limit the path of insertion and improve the stability of a removable prosthesis. Guide surfaces may occur naturally on teeth but more commonly need to be prepared.

Prosthodontics



- **The function of guiding planes:**

- a- Provide one path of insertion and removal of prosthesis without exerting excessive forces against the teeth and minimizes torque on abutments.
- b- The frictional contact of the prosthesis against these parallel surfaces can contribute to the retention of the prosthesis.
- c- Guiding planes can provide bracing and stability when they are located on the axial lingual surface of the tooth.
- d- Decrease the amount of wax block-out, thus eliminating food accumulation between abutments and RPD.
- e- Directs forces along the long axes of teeth.

5- Health of teeth used as abutment:

For example, in tooth-bearing dentures, if the molar is weaker than the bicuspid, an anterior tilt may be advisable, in order to place the clasp on the stronger tooth.