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KEEPING IN TIME – TILT OF THE CAST : A REVIEW

Dental Science

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ABSTRACT

PURPOSE: This study was aimed to review the different methods for reproduction of tilt of a cast on a surveyor.
METHODOLOGY: An electronic literature search was conducted through Medline via Pubmed, Wiley Online library, Ebscohost, Science Direct, as well as the Google Scholar for article published between October 1973 and March 2016, using the key words, tilt of cast, surveying, path of insertion, preservation of tilt and reproduction of tilt. A total of 20 articles were found out of these 8 were not related to present search and hence were excluded from the study. Finally 12 articles were found to be relevant.
RESULTS: All the techniques given by the different authors are having both advantages and disadvantages.
CONCLUSION: The path of insertion of a removable partial denture must be determined during treatment planning and permanently recorded on the cast. Literature has suggested several methods for the reproduction of cast tilt on surveyors.

KEYWORDS

Tilt Of The Cast, Surveying, Preservation Of Tilt, Reproduction Of Tilt, Path Of Insertion.

MAIN TEXT

INTRODUCTION:

Removable dental prosthesis (RDP) is still considered a treatment of choice for partially edentulous patients when fixed dental prosthesis or implant supported restorations are not possible because of technical, biologic conditions and financial concerns. Clinician should consider biologic and biomechanical elements in RDP treatment planning. Appropriate analysis of the diagnostic cast is one of the initial and fundamental steps in planning RDP.[1]

Surveying the diagnostic cast allows the clinician to study and design an adequate planning for RDP framework.[1,2] Determining the best path of insertion and removal is an essential step in RDP's planning. The path of insertion is determined with the surveyor regards to height of contours, guiding planes, interferences and esthetics for RDPs.[1,2,3]

The path of insertion should be exactly recorded on the study cast in order to be transferred into definitive cast or working cast. This also allows the dental technician to reposition the casts on the surveyor.[1,2,3]

The tilt of the cast determines at what angle the partial denture will seat over the remaining teeth. This angle is referred to as the path of placement or path of insertion. It may be impossible to achieve the optimum among all factors which affect the path of insertion as one or other may need to be compromised. It is only clinical judgment which finally dictates and may be compromised without sacrificing the quality of service. The four factors that should be considered before final path of placement are retentive undercuts, interferences, aesthetics and guiding planes. The tilt of a cast must be recorded so that it can be easily transferred from the cast holder of the surveyor and subsequently reproduce it in its original position in designing and fabrication of a removable partial denture, so the main purpose of the article is to review the different methods for preservation and reproduction of the cant of the cast in fabrication of Cast Partial Denture (CPD).[1,2]

METHODOLOGY:

An electronic literature search was conducted through Medline via Pubmed, Wiley Online library, Ebscohost, Science Direct, as well as the Google Scholar for article published between October 1973 and March 2016, using the key words, tilt of cast, surveying, path of insertion, preservation of tilt and reproduction of tilt. A total of 20 articles were found out of these 8 were not related to present search and hence were excluded from the study. The articles which are published in English language only considered. Finally 12 articles were found to be relevant. Standard textbooks were also referred. All the articles were followed for the technique mentioned and the advantages and disadvantages of the technique.

RESULTS:

The techniques mentioned are having both the advantages and disadvantages. Some of the methods mentioned are technique sensitive and required special equipment other than the surveyor and the things that are available in the laboratory, and even difficult for the technician to follow. Few methods used the materials that are available in the laboratory but need little time to fabricate them [**Table 1**].

DISCUSSION:

The Surveyor plays a cardinal role in the designing of a CPD. The GPT 9 defines a surveyor as a paralleling instrument used in the construction of a dental prosthesis to locate and delineate the contours and relative positions of abutment teeth and associated structures. As per literature a Surveyor is used in the following manner in the designing of a CPD [2]

1. Surveying the diagnostic cast,
2. Contouring wax patterns,
3. Surveying ceramic veneer crowns,
4. Machining cast restorations,
5. Placing intra coronal retainers and internal rest seats,
6. Surveying the master cast.

As the listing reveals tripoding is one important component of surveying. Thus although tripoding is not a component of surveying per se it does play an important role in the overall procedure of surveying as tripoding allows the reorientation of a cast on the tripoding table to a pre-determined path of insertion even after the cast has been moved from the surveying table. This enables multiple users to access the instrument which otherwise would be inaccessible till an individual user has completed the entire design process.This article focused on the variety of methods adopted to perform tripoding obtained from a literature review from [oldest year to current one],

tripoding plays an important if indirect role in the vital and mandatory aspect of CPD design, surveying literature survey reveals a plethora of techniques and they are listed in Table 1.

As mentioned in the standard textbooks tripod marks, vertical lines on the base of the cast, three marks on the sides of the base of the cast were used to preserve and reproduce the cant of the cast during fabrication of CPD. Kaloyannides TM[4], used geometric method for knowing the cant of the cast and its preservation. Acrylic was used by De Fiori SR[6] as plate of 2mm thickness and by Ansari IH[8] as U- shaped acrylic tray and by Shakibamehr AH et al.,[12] as acrylic plate and bulk of acrylic to the analyzing rod, but the main disadvantage with the acrylic is polymerization shrinkage. Wagner AG et al., [5] investigated the three methods that are mentioned in books along with the cemented pin method and concluded that cemented pin method was easier to transfer the cant of the cast, but the main disadvantage with the cemented pin method is its difficulty while using the articulator. Bezzon OL et al., [9] used pin and sheath method where pin is not directly cemented to the cast but placed in a sheath which is cemented in the cast and pin is retained in sheath by friction and can be removed during mounting and can be attached when using a surveyor. Sheath is used to overcome the disadvantage of the cemented pin method.

Steas AD[7] used a new repositioning instrument using 3 flat strips, Dumbrigue HB et al., [10] used Cast Angle Tool (CAT) containing an inclinometer, Sajjan S MC[11] used an tripoder attachment, Abolhasmi M et al., [13] used laser, Savabi O et al., [14] used a device with gradations, but all these methods needed additional devices other than the surveyor and the surveying tools and additional training for both the dentist and the technician.

All the methods focused on the preservation of the cant of the cast and its reproduction on the other working casts, each method is having one or other disadvantage.

CONCLUSION:

The fabrication of an RPD as a viable treatment modality for oral rehabilitation must be based on mastering the use of the dental surveyor, starting with the understanding of the aspects involved in the dynamics of insertion and withdrawal of the prosthesis. Compromising the ideal in the location and design of components, however, may jeopardize the potential success of the prosthesis. Preservation of tilt helps in ideal placement of components and success of prosthesis. The cant or tilt of a cast plays an important role in the fabrication of a c- RPD since the tilt of the cast determines the dynamics of placement and removal of the prosthesis. Recording the tilt or cant is important since the design process might necessitate multiple removal and placement of the cast on the surveyor for verification procedures. Failure to replace the cast in the original position will jeopardize the fabrication process and in turn the success of the RPD. Hence recording the cant of the cast or 'tripoding' assumes importance .this article attempts to collate and critique the various methods developed to do so.

Table no:1

S.No	Given By	Used	Advantages	Disadvantages
1.	Kaloyannides TM[4] in 1973	Protractor (fig1c)	• Geometric technique • Position is measured in degrees • Method is simple, easy to use • Not effected by the shape of the cast • Reproducibility is independent of the wear or fracture of the preliminary cast	• Any point on the cast as a reference point, cannot not possible to use, like where concave places such as sockets cannot be used.
2.	Wagner AG, et al[5]., in 1976	Investigated 4methods • Tripod marks (fig3b) • Vertical lines on sides of base of the cast(fig3c) • 3 marks on the sides of the base of the cast (fig3d) • Cemented pin method (fig4a)	• Path of insertion made by use of the cemented pin method required the least time for the technicians to reposition the cast on the surveyor table	
3.	De Fiori SR et al[6]., in 1983	• Acrylic resin plate of 2mm thickness (fig4b)	• easy technique to transfer the path of insertion from the diagnostic cast to multiple working casts	• Availability of device is difficult. One has to make the device it is not commercially available, time taking to fabricate • shrinkage of the acrylic material
4.	Steas AD[7] in 1987	New type of repositioning instrument(fig 2d) • 2 flat strips 5mm wide and 5.5 cm long 1mm thick. Drill a 2mm diameter hole 10mm from one end of each strip and 2mm hole 5mm from other end of each strip. • make1 flat strip 1mm thick, 5mm wide, 7.5cm long, 2mm wide & 4.5cmlong, 5mm from end. Make 2mm diameter, 10mm from other end. • slider	• Simple • Easily executed • Allows thethree selected points to be positioned in one movement, unlike other methods in which each of three points are repositioned separately.	• Availability of device is difficult.
5.	Ansari IH [8] in 1994	U – shaped universal acrylic tray (fig 1b)	• Simple • Can be done with materials that are readily accessible • Because the position of the cast in the horizontal plane has been fixed by the impression tray – attached to the stylus that is fastened to the vertical arm of the surveyor, it is only necessary to relate the parallelism of the vertical arm of the surveyor with the hole in the cylinder on the tray to reproduce the same tilt. Other methods require separate repositioning of each of 3 points • Universal U- shaped tray can be cleaned and reused for any maxillary or mandibular cast • There is no need to lock the vertical arm of the surveyor at the fixed horizontal plane • One surveyor can be used for surveying many casts of different patients	• Availability of device is difficult. One has to make the device it is not commercially available

6.	Bezzon OL et al[9]., in 2000	Pin & sheath method (fig1d)	• Precise method • Eliminates the disadvantage of not being able to use an articulator to study occlusal masticatory pattern • Permits the analysis of occlusal relationships of the cast in articulator with any intereference caused by fixed registration pin.	• Availability of device is difficult. One has to make the device it is not commercially available.
7.	Dumbrigue HB et al[10]., in 2003	• Uses cast angle tool (CAT) (fig2a) consists of an inclinometer, mounted an center of 3.5* 3.5 inch metal plate with a spring loaded swivel mechanism.	• Allows measurement of cast orientation in frontal & sagittal planes • Modifications to cast angulation in the frontal or sagittal planes may be made precisely and measured in one degree increments with this device.	• Additional cast for CAT, because both dentist and laboratory will need to have one. • Recorded measurements are only valid in conjunction with the VPS index used to record cast orientation
8.	Sajjan S MC[11] in 2006	• Tripoder attachment (fig2c)	• Freedom to select the points, which need not be present in a single plane • Easy and less time consuming for orientation • Accurate lab authorization • Can also be used to assess the path of insertion if measuring rods are placed with analyzing rods • Eliminate many errors that may happen during lab authorization	• Additional cost • Both dentist and laboratory person should have
9.	Shakibame hr AH, et al.,[12] in 2013	• Acrylic plate, bulk of acrylic to the analyzing rod (fig1a)	• Simplicity, accuracy, less working time and no need for any additional devices • Both study casts and definitive can be reoriented with same occlusal index	• Analyzing rods of various surveyor systems are different, so this technique can be used only in similar surveyors • Acrylic resin index may jeopardise the accuracy of the cast • Shrinkage of acrylic resin may result in inaccurate adaptation of acrylic index on teeth occlusal surfaces &/ rigid area
10.	Abolhasmi M, et al.,[13]	• Laser (fig 2b)	• Simple • Time saving	• Not economic • Requires extra devices
11.	Savabi O et al.,[14] in 2015	• Uses a device (fig 3a) 3narrow strips 2 short with 5holes 1long with 7holes • Attach screw & nut to the other ending holes of 2 short narrow strips • Gradate the surveyor spindle into millimetres degrees	• accurate	- need for additional device and time for construction of device
12.	Patil PG et al.,[15] in 2016	• putty elastomeric orientation index (POI) (fig4c)	• Simple • Accurate • Special devices can be avoided • Index can be preserved & used multiple times	• Dimensional discrepancies of putty

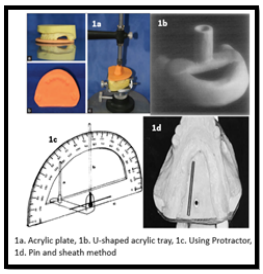

Fig: 1

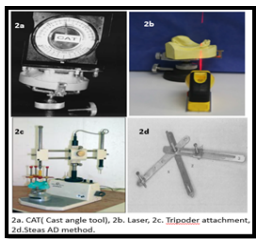

Fig: 2

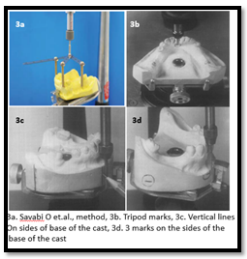

Fig: 3

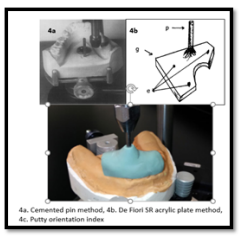

Fig :4

Fig : 1 (1a. Acrylic plate, 1b. U-shaped acrylic tray, 1c. Using protractor, 1d. Pin and Sheath method)

Fig : 2 (2a. CAT(Cast Angle Tool), 2b. Laser, 2c. Tripoder attachment, 2d. Steas AD method)

Fig: 3 (3a. Savabi O etal., method, 3b. Tripod marks, 3c. Vertical line on sides of the base of the cast, 3d. 3marks on the sides of the base of the cast)

Fig : 4 (4a. Cemented pin method, 4b. De Fiori acrylic plate method, 4c. Putty Orientation Index)

REFERENCES:

1. Phoenix RD, Cagna DR, DeFreest CF. Stewarts's Clinical Removable Partial Prosthodontics. 4th ed, Hanover park; Quintessence:2008.
2. Carr A B, Brown D T, Mc Givney. McCracken's Removable partial Prosthodontics. 12th ed, Elsevier Mosby; New Delhi: 2012.
3. Rudd KE, Morrow RM, Rhoads JE. Dental Laboratory Procedures-Removable Partial Dentures-Volume three.2nd ed. Elsevier Mosby company; St. Louis, Torronto.
4. Kaloyonnides TM. Reproduction of tilt of a cast on a surveyor. J Prosthet Dent 1973;30;465-7.
5. Wagner AG. A study of four methods of recording the path of insertion of Removable partial Denture. J Prosthet Dent 1976;35:267.
6. De Fiori SR, Miranda ME. Transferring the path of insertion from the diagnostic cast to multiple master casts. J Prosthet Dent 1983;50(5):733-34.
7. Steas AD. Recording and reproducing the tilt of a cast on a surveyor J Prosthet Dent 1987;57(1):121-25.
8. Ansari IH. A procedure for reorienting a cast on a surveyor. J Prosthet Dent 1994;72;104-7.
9. Bezzon OL, Riberio RF, Pagnano VO. Device for recording the path of insertion for removable partial dentures. J Prosthet Dent 2000; 84:136-8.
10. Dumbrigue HB, Chingbingyong MI. A new method for recording and reproducing cast orientation on a survey table. J Prosthet Dent 2003;89:76-
11. Sajjan S MC. A simple attachment to the surveyor for effective transfer of path of insertion from diagnostic cast to the working cast. J Indian Prosthodont Soc 2006;6(2):72-4.
12. Shakibamehr AH, Askari N, Abolhasani M, Moradpoor H, Nejatidanesh F. A procedure for recording and reproducing the cast position on a surveyor. Dent Res J (Isfahan). 2013 Sep-Oct; 10(5): 695–696.
13. Abolhasani M, Shakibame A, Asli H N. A Technique for Registration and Reorientation of Surveyed Dental Casts. J Dentomaxillofac Radiol Pathol Surg 2014; 3(2): 33-5.
14. Savabi O , Shirban F. Recording the Tilt of a Cast on a Surveyor. The Open Dent J 2015, 9, 174-175.
15. Pravinkumar G, Smitha P. Simple Technique to Reorient Different Casts of Same Patient on a Dental Surveyor. J Prosthodont 2016; 1-3.