

Digital Recording of Tilt of the Cast with Modified Surveying Platform

Bye Bye Conventional Tripoding

Dr. Prakash Nidawani
Professor, Department of Prosthodontics
Navodaya dental college Raichur, Karnataka, India

Dr. Shiva Sai Vemula
Post graduate student, Department of prosthodontics
Navodaya dental college Raichur, Karnataka, India

Dr. Saumya Singh
Post graduate student, Department of prosthodontics
Navodaya dental college Raichur, Karnataka, India

Dr. Girish Galagali
HOD, Department of prosthodontics
Navodaya dental college Raichur, Karnataka, India

Abstract:- Surveying is a part of CPD, designing and it helps to determine the path of insertion⁴, withdrawal, locating favorable and unfavorable undercuts and etc. The primary cast surveyed is tripoded and the same marks must be transferred to master cast. But there are a few limitations while transferring conventional tripoding, which are: -

- Transferring the exact location of tripoded marks on master cast is difficult
- Bias can occur among technicians or prosthodontist regarding the tilt.
- In order to overcome the above-mentioned limitations, we have devised an innovative approach to simplify the transferring of tripoded marks.
- The modifications include modified surveying platform, clinometer app and mobile holder and dental casts.
- The method simplified the transferring of tripoding marks and also elicits exact degree of tilt given, which is imaginary in case of conventional tripoding. The degree of tilt can be recorded accurately and digitally.

Keywords:- Tripoding, Surveying Clinometer, Smart Phone and Mobile Holder.

I. INTRODUCTION

During the first part of 20th century, RPDs were constructed using arbitrary techniques, by viewing dental casts at arm's length and guessing locations of mechanical undercuts. Henceforth, the insertion of such RPDs was time consuming and resulted in ill – fitting feel¹.

In the year 1918, Dr. A. J. Fortunati introduced dental surveyor at a dental clinic in boston¹.

It was essentially, a parallel meter- to determine the parallelism of surfaces¹.

In 1923, J.M. Ney Corporation introduced the first commercially available surveyor¹.

The digitalization has revolutionized in every sphere of life. These days mobile phones have become an organ of body.

Easily accessible mobile phone (clinometer app) is used to record and reorient the cast in an easy and innovative approach.

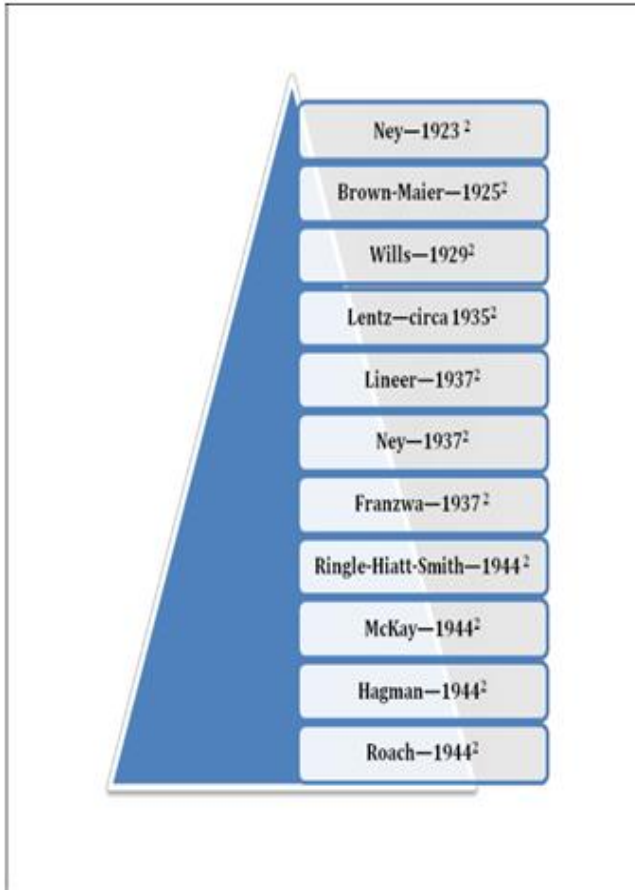
➤ Objectives

- To Avoid the Need of Manual Tripoding
- To Determine & Document Accurate Degree of Tilt To reduce the time and increase the accuracy in determining tilt.

➤ Historical Background

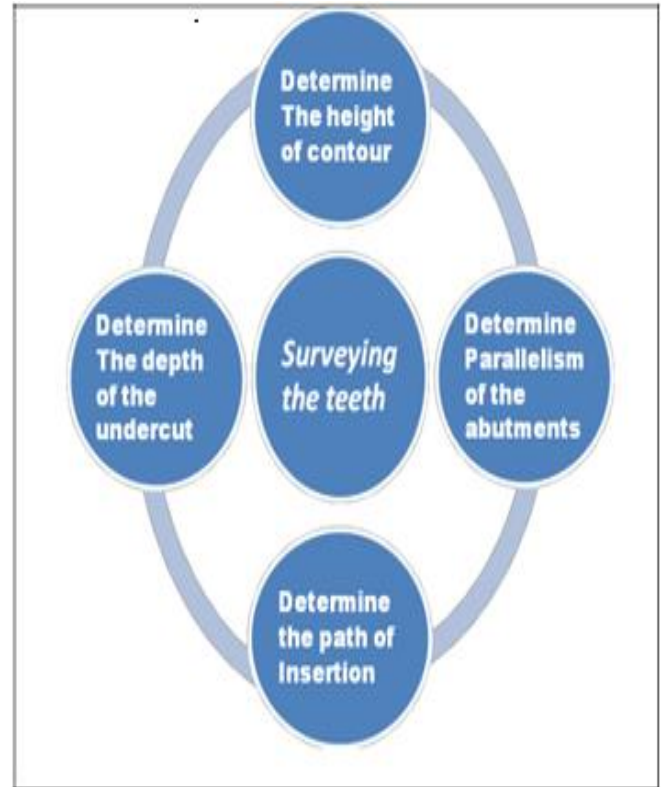
- Dr. Herman E. S. Chayes, an early pioneer in both fixed and removable prosthodontics, wrote extensively about precision attachments. Around 1920, Dr. Chayes developed the Parallelometer.²
- Dr. A. J. Fortunati was the first to demonstrate the advantages of using a mechanical device to map the contours of the abutment teeth.²
- Dr. A. J. Fortunati marked survey lines by replacing the steel rod by graphite rod.²
- Dr Kennedy coined the term “Height of contour”.²
- J. R. Schwartz credited Weinstein for pioneering “case and clasp surveying”²
- Stanton-Hanau Dental Surveying apparatus, patented in 1917²
- The original Ney surveyor was introduced in 1923. It featured a convenient palm rest on the top of the vertical arm. Designed by Weinstein and Roth, it was the first surveyor to be commercially available to the profession².
- 11 dental surveyors had been featured in scientific exhibits at the American Dental Association's 1948. Annual Meeting. These were:

Table 1 list of Contributors in Surveyors



- Surveying the soft tissue contours on the cast³

Table 2 Schematic Representation of Objectives of Surveying



➤ *The Surveyor is Available in Various Designs, but Most of them have Following Parts: -*

- Cast holder or surveying table¹
- Vertical arm
- Horizontal arm
- Surveying arm
- Surveying tools

➤ *Objectives of Surveying*

- Design RPD with its flexible and rigid components in such a way as to achieve adequate retention and bracing.³
- To determine path of insertion of prosthesis³
- To mark height of contour of the area³
- To mark survey lines³

➤ *Steps in Surveying Includes*

It can be Divided Into Various Phases.

- Preliminary visual assessment of diagnostic /study cast
- Initial survey¹
- Analysis¹
- Final survey¹

➤ *Surveying of the Primary Cast Includes*

- Analyzing the cast³
- Surveying the teeth³

➤ *Determining the Path of Insertion of the Denture*

Parallelism of abutment teeth are inspected Cast is tilted along the long axis of abutment tooth is parallel to the vertical axis. Tilt gives the angle of path of the insertion. It is said that tilt should not be exceeded by 10 degrees³.

➤ *Tripoding of the Primary Cast*

In order to have the same path of insertion as that in the master cast, it is necessary to retain the tilt decided by the primary cast. Tripoding is used to preserve the tilt in the primary cast. It consists of three different widely spaced-out points of a single plane.

Transferring the tripoding marks on to master cast. This procedure is done to reorient the master cast using the same angulations of primary cast

- *The Three Additional Reference Points Used are, Other than Tripoded Marks: -*

- ✓ Distal marginal ridge of first premolar³ Incisal edge of lateral incisor³
- ✓ Lingual cusp tip of first premolar on the opposite side.³

➤ *Limitations of Conventional Tripoding*

- Using the anatomical reference cannot hold good in all patients, as few teeth may be grossly destroyed, mutilated or even for that matter, even is absent.
- Recreation of exact 10-degree tilt is uncertain.
- Transferring the tripoded marks can be difficult
- Marked lines on the tripoded cast can be worn while handling or transferring to the master cast
- Bias can occur among technicians or Prosthodontists regarding the tilt.

Considering the above limitations, an innovative approach has been developed to simplify the transferring of tripoded marks. The modifications include:-

➤ *Armamentarium*

Broken arm surveyor
 Surveying platform
 Metal extension plate
 Two thumb screws
 Detachable rigid mobile holder
 Clinometer app { Android phone }



Fig 4 Diagnostic cast



Fig 1 Thumbscrews



Fig 5 Master cast



Fig 2 Metal Extension Plate Measured with Vernier Caliper



Fig 3 Mobile holder



Fig 6 Broken arm surveyor



Fig 7 Midlines Marked on Metal Plate

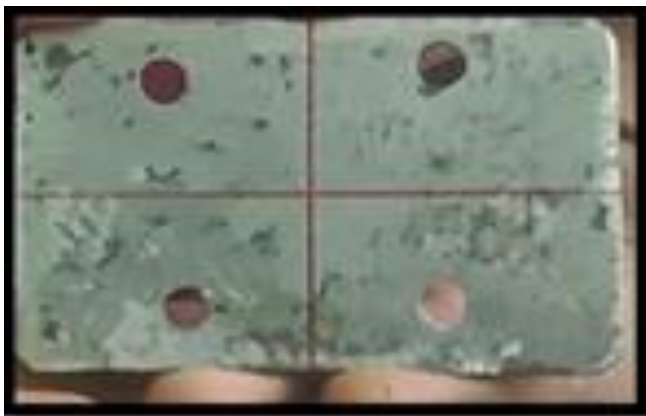


Fig 8 Mobile Holder Attached to the Mobile

II. PROCEDURE

A customized metal plate of dimension 85 mm x55mm divided by two lines to mark the midpoint of the metal extension plate. The customized metal plate is screwed below the survey table by two thumbscrews.



Fig 9 Midline of the Mobile Holder Corresponding to the Midline of the Mobile

The surveying table with screwed metal plate is been mounted to the surveyor. The detachable mobile {premarked} holder is attached to the metal plate. Ensuring the midpoint of mobile holder to coincide with the midpoint with the metal plate. The clinometer app is digital protractor which has degrees from 0 to 90. The android phone with the

clinometer app is also measured and its midpoint is been marked. While placing mobile phone on the detachable mobile holder, midpoints must coincide between the midpoints of mobile phone and midpoints mobile holder.



Fig 10 Metal Plate Being Secured by Thumb Screws on Surveying Table



Fig 11 Attached Metal Plate with Surveying Table

➤ Positioning the Cast

- The surveying table is divided into 2 equal halves by drawing mid line across the table
- The mid-point of the cast is drawn and extended till the base of the cast, while placing the cast on the surveying table, the midlines of the cast should correlate with the mid line of the surveyor table.



Fig 12 Modified Surveying Table Placed on the Surveyor



Fig 13 Midlines Drawn on Metal Plate is Extended on the Surveying Platform and the Diagnostic Casts are Coinciding



Fig 16 To Record Antero-Posterior Tilt, the Mobile is Attached to the Lateral Side of the Plate.



Fig 14 The Mobile Holder is Oriented so that its Midline Aligns with the Metal Plate's Midline.

➤ *Anteroposterior Tilt*

The mobile holder attached to lateral side of the plate to record Antero posterior tilt

➤ *Recording Lateral Tilt: -*

Again, that mobile holder is detached and attached to the anterior part of metal plate to record right lateral tilt/left lateral tilt



Fig 17 The master cast is positioned using the same reference degree of tilt as the primary cast.



Fig 15 The Mobile is Attached to the Anterior Part of the Plate to Record Lateral Tilt.

After noting the digitally recorded tilt from the primary cast, the primary cast is removed from the surveying table and keeping the obtained readings as reference the surveying table is reoriented using the clinometer app, The master cast is placed on the surveying platform and same degree of tilt is transferred to master cast.

III. ADVANTAGES

- *Flexibility to choose the points, which do not have to be in one plane⁵.*
- *Reorientation is simple and takes less time.*
- *Accurate lab authorization.*
- *It can eliminate many errors*

IV. CONCLUSION

- *This innovative approach has made to say bye bye to cumbersome conventional tripoding.*
- *Tilt of the cast can be recorded digitally and accurately, which allows easy transferred to master cast.*
- *It's a new device that is simple to use and that allows cast orientation to be recorded and reproduced has been described.*

REFERENCES

- [1]. Stewart's clinical REMOVABLE PARTIAL PROSTHODONTICS – 4th Edition and 2nd edition
- [2]. Engelmeier RL . The history and development of dental surveyor : Part 1. Journal of prosthodontics. 2002 Mar;11{1}:11-8.
- [3]. Deepak Nallaswamy: textbook of prosthodontics , 1st edition
- [4]. Shakibamehr AH, Askari N, Abolhasani M, Moradpoor H, Nejatidanesh F. A procedure for recording and reproducing the cast position on a surveyor. Dental Research Journal. 2013 Nov 24;10(5).
- [5]. Sajjan MS. A simple attachment to the surveyor for effective transfer of path of insertion from diagnostic cast to the working cast. The Journal of Indian Prosthodontic Society. 2006 Apr 1;6(2):72.
- [6]. Sayed ME, Busaily IA, Nahari RJ, Hakami RO, Maashi SM, Ramireddy NR. Evaluation of Cast Re-Orientation on a Dental Surveyor Using Three Tripod Techniques: A Survey and In Vitro Study. Journal of Prosthodontics. 2018 Oct;27(8):700-7.
- [7]. Dumbrigue HB, Chingbingyong MI. A new method for recording and reproducing cast orientation on a survey table. The Journal of prosthetic dentistry. 2003 Jan 1;89(1):76-8.
- [8]. Steas AD. Recording and reproducing the tilt of a cast on a surveyor. The Journal of Prosthetic Dentistry. 1987 Jan 1;57(1):121-5.
- [9]. Gali S, Lanka HB. A reproducible 3-point contact device for tripoding a definitive cast. The Journal of Prosthetic Dentistry. 2020 Mar 1;123(3):408-10.
- [10]. Kawade RA, Sathe S, Apte A, Bhojar A, Jaiswal T, Dubey SA. A Systematic Review of Tripoding: A Step Towards Successful Rehabilitation. Cureus. 2022 Nov 4;14(11).
- [11]. Afsal AS, Aravindakshan S, Thomas S, Musthafa N, Ismail S. Putty index for tripoding. Journal of Prosthodontics. 2019 Jan;28(1):e431-3.
- [12]. von Krammer R. Accurately positioning a duplicate cast on the surveying table. The Journal of Prosthetic Dentistry. 1989 Mar 1;61(3):378-80.
- [13]. Rohini R, Mishra A, Singh RD, Jurel SK, Chand P. A review of various methods of tripodization in removable partial denture to introduce a simplified classification system. Journal of Oral Research and Review. 2022 Jul 1;14(2):172.
- [14]. Bezzon OL, Ribeiro RF, Pagnano VO. Device for recording the path of insertion for removable partial dentures. The Journal of Prosthetic Dentistry. 2000 Aug 1;84(2):136-8.
- [15]. Knapp JG, Shotwell JL, Kotowicz WE. Technique for recording dental cast-surveyor relations. The Journal of Prosthetic Dentistry. 1979 Mar 1;41(3):352-4.
- [16]. Patil PG, Nimbalkar-Patil SP. Simple Technique to Reorient Different Casts of Same Patient on a Dental Surveyor. J Prosthodont. 2018 Mar;27(3):314-316.
- [17]. Kamble VD, Parkhedkar RD, Bhowmik H. A magnetic device for recording and reproducing the path of placement for partial removable dental prostheses. Journal of Prosthetic Dentistry. 2013 Oct 1;110(4):333-4.
- [18]. Sykora O. A new tripoding technique. The Journal of Prosthetic Dentistry. 1980 Oct 1;44(4):463-4.