ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2019; 5(1): 95-98

www.oraljournal.com
Received: 15-11-2018
Accepted: 19-12-2018

Dr. Renu Gupta
Professor & Head,
Department of Prosthodontics & Crown and Bridge, H. P Govt. Dental College, Shimla, Himachal Pradesh, India

Dr. RP Luthra
Professor and Head,
Dept. of Dentistry, Dr Y.S. Parmar Medical College and Hospital, Nahan, Himachal Pradesh, India

Dr. Hardik Hitesh Sheth
Junior Resident,
Department of Prosthodontics & Crown and Bridge, H. P Govt. Dental College, Shimla, Himachal Pradesh, India

Correspondence
Dr. Hardik Hitesh Sheth
Junior Resident,
Department of Prosthodontics & Crown and Bridge, H. P Govt. Dental College, Shimla, Himachal Pradesh, India

Broadrick's occlusal plane analyzer: A review

Dr. Renu Gupta, Dr. RP Luthra and Dr. Hardik Hitesh Sheth

Abstract
In the field of Prosthodontics, determination of the occlusal plane plays an extremely important role in the functional and esthetic rehabilitation of the patient especially when restoration or reconstruction of most of the posterior teeth is required.
This is where the role of the Broadrick's Occlusal Plane Analyzer comes into play.
It is the aim of this review to acquaint the reader with the use of this technique in clinically relevant situations.

Keywords: Occlusion, occlusal plane, analyzer, BOPA

Introduction
According to the Glossary of Prosthodontic terms the term plane refers to a flat surface defined by three points whereas the term occlusal plane refers to the average plane established by the incisal and occlusal surfaces of the teeth; generally, it is not a plane but represents the *planar mean* of the curvature of these surfaces [1].
In the field of Prosthodontics, determination of the occlusal plane plays an extremely important role in the functional and esthetic rehabilitation of the patient especially when restoration or reconstruction of most of the posterior teeth is required.
The 3 most commonly used methods for establishing an acceptable plane of occlusion are direct analysis on natural teeth through selective grinding, indirect analysis of facebow-mounted casts with properly set condylar paths, and indirect analysis using the Pankey-Mann-Schuyler (PMS) method with the Broadrick's occlusal plane analyser (BOPA). When it has been determined that restoration of all or most of the posterior teeth is necessary, the PMS technique using BOPA provides a simple and practical method to assist in determining the preliminary occlusal plane on diagnostic casts [2].
It assists in locating the cusp tips of the posterior teeth. In addition, it can demonstrate how much tooth reduction or porcelain addition is needed to idealize the occlusal plane. [2]
It is the aim of this review to acquaint the reader with the use of this technique in clinically relevant situations.

Broadrick's Occlusal Plane Analyzer
Broadrick's Occlusal Plane Analyzer is a flag-like component attached superiorly to the upper member of an articulator. The technique incorporates Monson's spherical theory of occlusion to develop the occlusal plane. Monson proposed that the anteroposterior curve forms part of a 3-dimensional sphere, the center of rotation of which is located in the region of the glabella. The radius of this curve is reported to be an estimated 4 inches (10.4 cm), as proposed by Monson [1, 2] In this technique a compass is used to scribe two intersecting arcs with a four-inch radius in which the centers of rotation are located at the canine cusp tip and the distobuccal cusp tip of the second molar. The point of bisection of the arcs that are scribed on the Broadrick analyzer determines the center of rotation for the arc with a four inch radius that determines the occlusal plane [1, 2].
The curve of Spee may be pathologically altered in situations resulting from rotation, tipping, and extrusion of teeth. Restoration of the dentition to such an altered occlusal plane can introduce posterior protrusive interferences. Such interferences have been shown to cause abnormal activity in mandibular elevator muscles, especially the masseter and temporalis muscle [3, 4]

This can be avoided by reconstructing the curve of Spee to pass through the mandibular condyle, which has been demonstrated to allow posterior disocclusion on mandibular protrusion. As the angle of condylar guidance is greater than curve of Spee, posterior disocclusion is achieved [3].

The Broadrick Occlusal Plane Analyzer aka Broadrick flag permits reconstruction of the curve of Spee in harmony with the anterior and condylar guidance, allowing total posterior tooth disclusion on mandibular protrusion. Its use assumes proper functional and esthetic positioning of the mandibular incisors. Should the anterior guidance be inappropriate, it must be redesigned prior to use of the Broadrick flag [5]

Components and Use

The Broad rick Flag facilitates the construction and evaluation of the Curve of Spee and Wilson in perfect harmony with the anterior condylar guidance allowing total posterior tooth disclusion on mandibular protrusion thus helping to develop an acceptable curve of occlusion [6].

The BOPA has now been adapted to only a few articulator systems, such as the Denar Anamark Fossae (Teledyne Waterpik, Ft Collins, Colo) and all models of Hanau articulators (Teledyne Waterpik). For those manufacturers of semiadjustable articulators who do not offer such occlusal plane analyzers for use with their instruments, a custom made clear acrylic resin BOPA may be fabricated [2].

The Broadrick's Occlusal Plane Analyzer consists of a [7] (Fig.1):

1. Card Index.
2. Bow Compass with graphite leads with an extra center point and needle point.
3. Scribing knife.
4. Plastic Record cards.

The maxillary cast is mounted by a Facebow transfer and the mandibular cast is mounted in centric relation.

An accessory Split-Cast Mounting plate is mounted on the Upper member of the articulator. This split cast allows rapid cast removal and accurate replacement during the survey. It also provides a visual guide for adjustment of the articulator to protrusive and lateral interocclusion records

The following is a step by step method on how to use this tool [7]

1. The card index is placed on the upper member of the articulator. If one is using a custom made BOPA then a clear acrylic sheet 2mm thick and 4 inch * 4 inch in dimensions may be substituted. (Fig. 2)
2. Press a plastic record card over the dowels on the right side of the card index. The cards are matte finished on both sides, thus accepts ink or pencil markings readily. One can also use a sheet of blank paper to record the markings.
3. The radius of sphere in the Curve of Spee is suggested to be at 3.75 inches in skeletal Class II relationship, whereby a 5 inch radius is more appropriate in a skeletal Class III relationship [3]. A 4 inch radius is considered normal and most often used in majority of cases especially in Class I relationships.
4. A lead piece (such as a normal pencil) is inserted on to the compass and it is adjusted to a selected radius (such as 4 inches).
5. The center point of the compass is adjusted to the anterior survey point (A.S.P), which is usually the disto-incisal of the canines. If it is noticed that the cusp of the canine is attrited or worn our flat, the anterior survey point may be at the incisal edge. Once selected the point is marked on the cuspid and is not changed.
6. With the center of the compass positioned on the A.S.P, a long arc of 3 inches is applied on to the plastic record card. The occlusal plane survey center (O.P.S.C) will eventually be located on some point on the arc. (Fig. 3)
7. The posterior survey point (P.S.P) is selected at the distobuccal cusp of the lower last molar. In cases where there is an absence of the lower molar, the upper cast is replaced and a soft modeling compound is placed over the ridge, closing the articulator until the incisal pin contacts the incisal guide in a centric relation. The compound is chilled and the excess is carved away, leaving only compound contacting into the upper fossae, simulating the lower buccal cusp. The upper cast is removed and a posterior survey point (P.S.P) is selected on the modeling compound. An alternative PSP would be the anterior border of the condyle, represented by themost anterior point on the condylar element on the articulator.
8. The center point of the compass is positioned on the P.S.P and an arc is applied to intersect the arc from the A.S.P. (Fig 4.)
9. Place the center point of the Bow Compass, still adjusted to the 4" radius, at the inter- section of arcs on the Plastic Record Card (initial occlusal plane survey center).
10. The needle point is then swept over the occlusal surfaces of the lower posterior teeth to see how the arc conforms to the existing occlusal plane. This occlusal plane survey center (O.P.S.C) is shifted on the long arc on the plastic record card, the A.S.P line, until the most acceptable plane of occlusion and line is found. (Fig. 5)
11. If there is a need to raise the line and plane of occlusion at the distal end, the center point is moved anterior to the arc intersection. To lower the line and plane of occlusion, the point is moved posterior of the intersection.
12. After repeated trial and retrial, the ideal survey center forming the most acceptable line and plane of occlusion will be located and should be marked for subsequent relocation.
13. The scribing knife is for the placement into the compass for scribing and cutting the plaster, compound or wax during the occlusal plane correction.

Discussion

In 1963, Dr Lawson Broadrick developed an instrument to provide a guide to the most suitable position and orientation of the posterior occlusal plane. Its purpose was to permit reconstruction of the Curve of Spee in harmony with incisal and condylar guidance [8].

The Broadrick flag is a useful tool in prosthodontic and restorative dentistry, as it identifies the most likely position of the center of the curve of Spee. However, this position should not be regarded as fixed or immutable. Esthetics and function place a considerable demand on the design of the occlusal plane.

Compromise can be achieved by altering the length of the radius of the curve. In patients with a retrognathic mandible, a standard 4-inch curve would result in a flat posterior curve, causing posterior protrusive interferences. Such "low" mandibular posteriors would also lead to extrusion of the opposing maxillary teeth. If the maxillary posterior teeth were to be restored to this low occlusal plane, the crown-to-root ratio would be less than ideal. Hence, a 3.75 inch curve is more appropriate when a class II skeletal relationship exists. Conversely, a 4 inch curve would create a steep posterior

curve in patients with a class III skeletal relationship, leading to further posterior interferences. A 5 inch radius would be more suitable in this situation [5].

The center of the curve also may be varied to achieve the same effect. The center should always lie along the long arc drawn from the anterior survey point, but it may be moved in an anterior or posterior direction from the intersection of this arc with that drawn from the posterior survey point. This alteration will not affect the position of the anterior survey point, an important fact when the position of the mandibular anterior teeth is esthetically and clinically suitable [5].

Care should be taken to ensure that the angle of the condylar guidance is not less than the curve of Spee, as this would introduce posterior protrusive interferences [5].

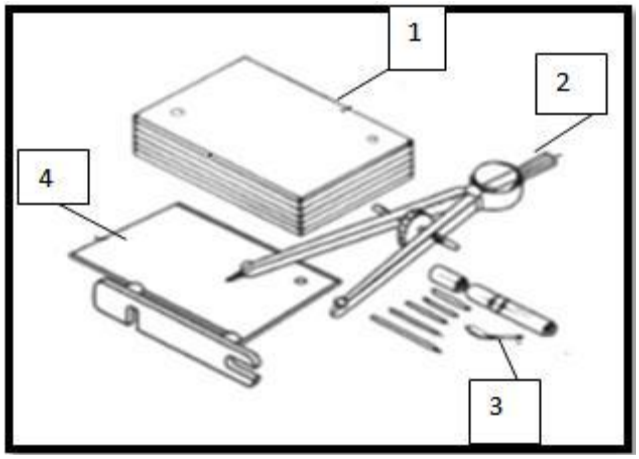

Fig 1: Parts of Broadricks Occlusal Plane Analyzer

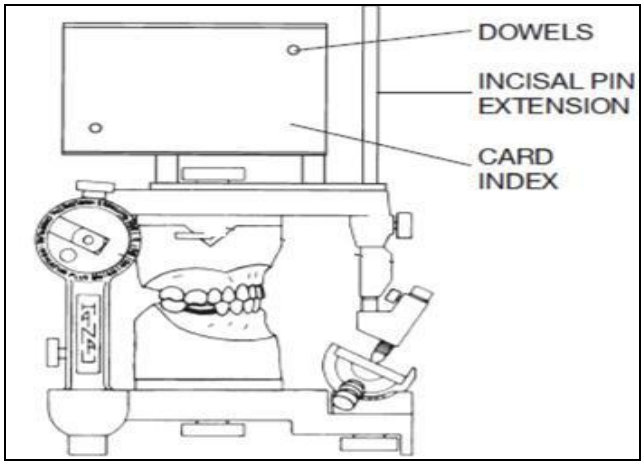

Fig 2: Preparation of the Analyzer

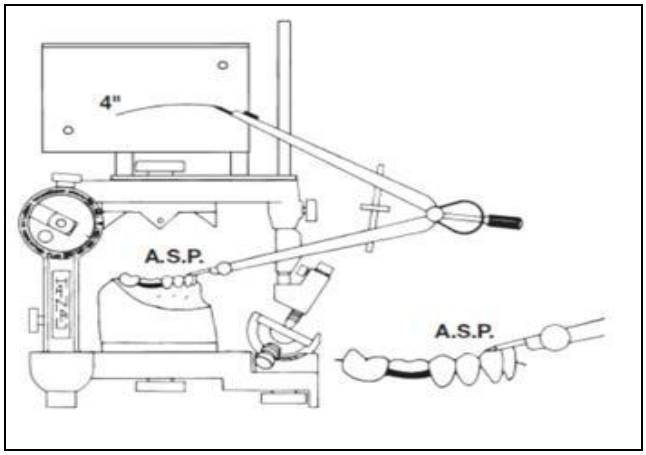

Fig 3: Selection of A.S.P

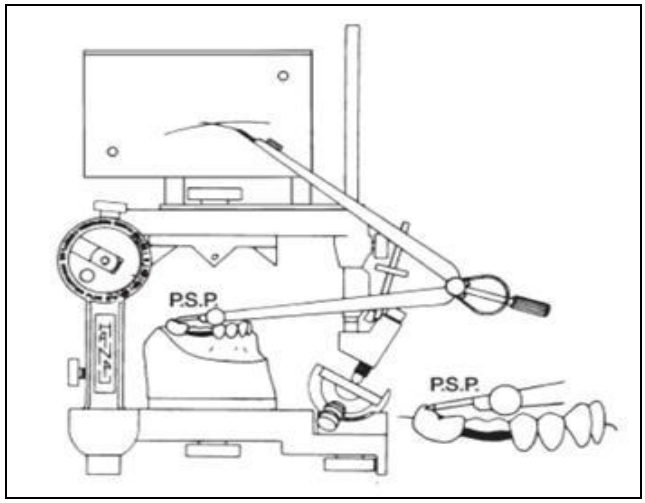

Fig 4: Determination of P.S.P

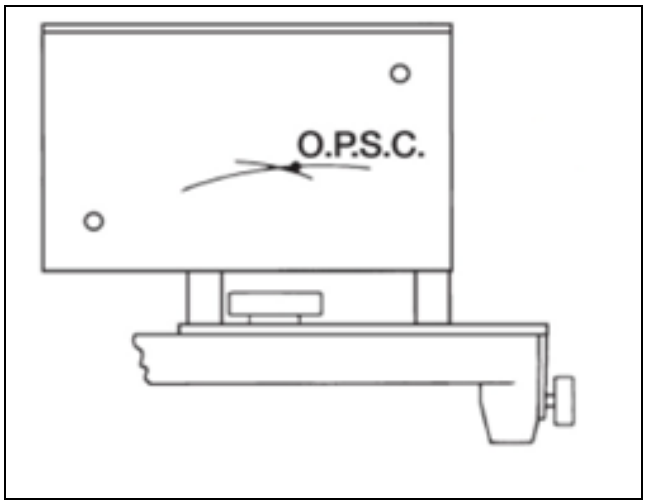

Fig 5: Occlusal Plane Survey Line

Conclusion

The use of BOPA aids the clinician in the development of an initial mandibular occlusal plane in diagnostic casts, and later, as an integral part of both the contours of the definitive restorations as well as a guide for the actual tooth preparations.

This is a huge help when treating cases requiring Full Mouth Rehabilitations as determining the occlusal plane is the first step towards a functionally and esthetically acceptable outcome thus directly affecting the quality of life of the patient.

References

1. The Glossary of Prosthodontic Terms, 9th Edition.
2. Bedia SV, Dange SP, Khalikar AN. Determination of the occlusal plane using a custom-made occlusal plane analyzer: A clinical report, Journal of Prosthetic Dentistry. 2007; 98(5):348-352.
3. Manvi S, Miglani S, Rajeswari CL, Srivatsa G, Arora S. Occlusal Plane Determination using Custom Made Broadrick Occlusal Plane Analyser: A case control study, International Scholarly Research Network Dentistry. 2012.
4. Williamson EH, Lundquist DO. Anterior guidance: its effect on electromyographic activity of the temporal and masseter muscles. J Prosthet Dent 1983; 49:816-23
5. Lynch CD, McConnell RJ. Prosthodontic management of the curve of Spee: Use of the Broadrick flag. J Prosthet

Dent. 2002; 87:593-7.
6. Chokalingam S, Rao Gururaj. Broadrick's Occlusal Plane Analyzer. IOSR-JDMS, 2014, 54-58.
7. W.M Corporation, Restorative oral health (U.S.A, Whip-Mix Corporation-West, 2008
8. Chaturvedi S, Verma AK, Ali M, Shah M. Full Mouth Rehabilitation using a custom-made broadrick flag: A case report, International Journal of Case reports and images. 2012; 3(5):41-44.