



Differences Between Closed and Opened Exposure of Palatally Impacted Maxillary Canines: A Review

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Abstract: Palatally impacted maxillary canines was found to be more commonly occurring than labially impacted canines. Proper orthodontic treatment of such cases necessitates the utilization of a proper method for surgical exposure of the canine. The open and closed exposure techniques are the currently available methods. Open exposure is done by uncovering the crown of the impacted canine and a periodontal pack is placed until mucosal healing occur around the exposed crown. The closed exposure technique implies raising a flap and exposure of the crown followed by bonding an attachment with chain or ligature wire then the flap is sutured with the chain bulging throughout the mucosa to allow for orthodontic traction. No major differences were found between the two techniques in terms of rates of success, complications during treatment, esthetics, time of treatment and periodontal health. In most cases conflicting results were found if any differences occurred between the two methods. However, there is some evidence that the need to repeat surgery is slightly higher in the closed exposure technique. Based on the current literature we cannot recommend certain surgical technique over the other.

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1-Introduction

Impacted maxillary canines are the second most commonly occurring problem after third molars impaction having an incidence of 1% to 3% (Bishara and Ortho, 1992, Lövgren et al., 2019). The maxillary canines follow a long path of eruption between 5 and 15 years of age which was estimated to be 22 mm. The eruption movements were also found to be in the posterior, vertical and lateral directions (Coulter and Richardson, 1997, Shukla, 2019).

Etiology of impacted canine was explained by two main theories which are: the genetic theory and the guidance theory. The genetic theory explains the cause of impaction by being caused mainly by a genetic factor. On the other hand, the guidance theory explains the cause of impaction by the lack of guidance during the eruption of the canine which is caused by a hypoplastic or congenitally missed lateral incisor (Becker and Chaushu, 2015). It is important to diagnose the palatally impacted canines in early stages as this may cause permanent impaction of the canine in a difficult position or resorption of the adjacent teeth (Bedoya and Park, 2009).

2. Techniques of Exposure of Palatally Impacted Maxillary Canines

Many cases with palatally impacted canines require surgical exposure followed by fixed appliance to align the impacted canines in place. There are two different techniques of exposure. The first technique is known as the open exposure technique and the second technique is called the closed exposure technique.

Open exposure is done by surgical removal of palatal mucosa and the bone covering the crown of the impacted canine and a periodontal or surgical pack is placed on the exposed area for 7 or 10 days until healing of the mucosa around the exposed crown of the canine occurs (Naoumova et al., 2018). Another method was suggested by Nordenvall as a simpler alternative to the surgical dressings was the use of glass ionomer cement. It was concluded that glass ionomer cement can be advocated as a substitute to surgical dressings in surgical exposure of palatally impacted canines (Nordenvall, 1992, Nordenvall, 1999, Naoumova et al., 2018). After removal of the pack that is covering the exposed crown, the canine is left to spontaneously erupt in 4-6 months then a bonded attachment is positioned on the exposed crown to begin the orthodontic traction (Parkin et al., 2015). Another method for the surgical exposure palatally impacted canines is the closed exposure technique. The technique implies raising a flap followed by bone removal to expose the crown of the impacted canine. A bonded attachment with a chain or

ligature wire is placed over the crown and the flap is repositioned and sutured allowing the chain to bulge throughout the mucosa. This is followed by orthodontic traction to bring the canine in place (Crescini et al., 2007, Björksved et al., 2018).

3. Open versus closed surgical technique

Success and failure rates of the techniques:

The rate of success of closed surgical technique after 10 days of canine exposure was found to be slightly higher than that of the open surgical technique (Parkin et al., 2017). However, these differences were non-significant and was probably due to chance. A study conducted by Parkin et al., found that out of 31 patients undergone open surgical technique 28 cases were successful and 3 failures were reported. On the other hand, out of 33 patients in the closed surgical technique, 31 cases were successful and only 2 failures occurred (Parkin et al., 2012).

Complications during treatment

Complications such as swelling, bleeding and infection was investigated in a recent study by Björksved et al., and found that after a follow up period of 4 weeks from surgery in both techniques there were no significant differences between the two techniques in cases having a unilateral impaction. On the other hand, cases with bilateral impactions showed higher complication rate in the open surgical technique group (Björksved et al., 2018).

Another study investigated the failure of exposure of the canine, the bond detachment, extraction due to loss of periodontal attachment and failure of eruption in both techniques. The rate of complications was 2 times higher in the patients undergoing bracketing when compared with having simple exposure and waiting for the tooth to erupt. The study concluded that both techniques are effective at handling the palatally impacted canine and found that gold chains are more reliable than ligature wires when traction of the canine is done (Pearson et al., 1997).

The results of complications after surgery was also reported in other studies to be more common in the closed surgical technique than in that of the opened technique. These complications included detachment of the gold chain and fenestration of the palatal mucosa by the attached chain (Parkin et al., 2012, Parkin et al., 2017).

The need to repeat surgery

When using the closed surgical technique, failure in bonding by the attachment usually necessitate repeating the surgery. On the other hand, when using the opened surgical technique, the overgrowth of the surrounding soft tissue may necessitate another surgical intervention to remove these tissues. However, current evidence indicates that the need to

repeat surgery is more common with the closed surgical technique due to failure in bonding (Burden et al., 1999).

4. Esthetics

There were no differences between closed and opened surgical techniques regarding positioning of the canine in the dental arch nor its inclination. The color also did not show any clinically significant differences between groups (Smaliene et al., 2013).

5. Response of Patients to Treatment

Patient discomfort was evaluated for both techniques using pain scores, eating difficulties, speaking difficulties, brushing difficulties, and the feeling of bad taste inside the mouth. No significant differences were detected between the two groups in any of these parameters (Parkin et al., 2012).

Patient's pain perception after the open and closed surgical exposure of cases having a unilateral impaction was investigated in 32 patients. The results showed no statistically significant differences in pain perception between the 2 groups. However, the rate of reduction in pain scores was higher in the closed surgical exposure group (Gharaibeh and Al-Nimri, 2008).

Parkin et al., (2012) found also similar results showing that there is no evidence of any difference in pain score between the two techniques at day one postoperatively which was ranging from moderate to severe pain. However, none of the patients had any moderate or severe pain after one week of the surgery in both techniques. Also a binary outcome was used to assess the pain by asking whether any analgesic was needed or not in different time intervals after the surgery. The results also did not show any significant differences between the two techniques (Parkin et al., 2017).

Another recent study also evaluated patients' perceptions of treatment by analyzing degree of pain, analgesic consumption, impact on the daily activities and impairment of jaw functions in the evening of the day of surgery and after 7 days. A higher pain level was recorded during injection of local anesthesia in the closed surgical exposure group while the post-surgical pain of the day of surgery was significantly higher in opened surgical exposure group. Consumption of analgesics showed no significant differences between both groups. However, when evaluating pain after 7 days, the opened surgical exposure group showed significantly higher level of pain (Björksved et al., 2018).

Patient satisfaction with treatment was also assessed and was evaluated by patients undergoing the two procedures and asking them after finishing the treatment is it satisfactory or not. All patients reported

that they were satisfied by both techniques (Smailiene et al., 2013).

6. Time of Treatment

The length of time during surgery

The length of time during surgery was reported by calculating the amount of time needed from the beginning of incision (not including the time for local anesthesia) to the final suturing or application of dressing. Gharaibeh and Al-Nimri found that the mean duration of surgery for the open surgical technique was significantly less than that of the closed surgical technique with a mean duration of 30.9 ± 10.1 min and 37.7 ± 8.4 min respectively (Gharaibeh and Al-Nimri, 2008). On the other hand, Parkin et al., failed to find any significant differences between the two techniques. However, outliers were detected in these procedures such as additional time for extraction of the premolars in the open surgical technique group, extraction of all first molars and labial frenectomy was also done in this group. So, by removing these outliers no statistically significant differences were detected between the two groups (Parkin et al., 2012). Björksved et al., also found similar results to that of Parkin showing that there are no statistically significant differences between the two groups. However, it was reported that the closed surgical group had slightly longer time than that of the opened surgical group but was insignificant. It was also found that the time of surgery for patients having a unilateral impacted maxillary canine was significantly lower than patients having bilateral impaction regardless of the utilized surgical technique (Björksved et al., 2018).

Time needed for the eruption of the canine

There were no statistically significant differences in the duration from time of bonding and traction of the canine to the removal of fixed appliance and found no evidence of any significant difference in the total treatment time between the open and closed surgical techniques. Although a shorter time was noted from exposure of the canine to its eruption in the open surgical technique (Smailiene et al., 2013).

7. Periodontal Considerations

Probing depth

Probing depth was assessed in 6 points around the a unilaterally impacted maxillary canine including mesiobuccal, buccal, distobuccal, distopalatal, palatal, and mesiopalatal after the end of active treatment. Measurements of the probing depth did not show any significant difference between the open and closed surgical techniques. However, significant difference was observed between the normally erupted and the impacted canines showing that impacted canines exhibited deeper mean pocket depths which were

statistically significant but not clinically important (Smailiene et al., 2013).

Gingival inflammation and bleeding on probing

Gingival Index and Papilla Bleeding Index were used to evaluate the amount of gingival inflammation and bleeding on probing around the a unilaterally impacted maxillary canine after the end of active treatment. The results did not show any significant differences between the two techniques as all cases had good oral hygiene (Smailiene et al., 2013).

Clinical attachment loss

The amount of clinical attachment loss was compared between open and closed surgical techniques around a unilaterally impacted maxillary canine after the end of active treatment by measuring the probing depth and adding its value to the amount of gingival recession present around the canine. The results also did not show any significant differences between the two techniques (Parkin et al., 2012).

Crestal bone level

Crestal bone level was measured on the mesial and distal side of the impacted canine after treatment using intraoral digital periapical radiographs. The findings showed that there is no evidence of any difference in the amount of loss in the crestal bone between the open and closed surgical techniques (Smailiene et al., 2013). On the other hand, when comparing the amount of loss in the crestal bone around the impacted canine to that of the normally erupted canine, a significant difference was observed showing lesser amount of bone support around the treated canine. This finding was supported by many studies that showed similar results (Becker et al., 1983, Schmidt and Kokich, 2007, Parkin et al., 2012, Smailiene et al., 2013).

Gingival recession

Gingival recession was measured on the mesiobuccal, buccal, distobuccal, distopalatal, palatal, and mesiopalatal surfaces using 6-point probing. The results also did not show any significant differences between the two techniques (Parkin et al., 2012, Smailiene et al., 2013).

7. Conclusion

This review has revealed that palatally impacted canines which was surgically exposed using open surgical technique or by using closed surgical technique have a small reduction in the periodontal support when compared with a normally erupted canine. Regarding other aspects of treatment, the current scientific evidence cannot support the use of certain technique over the other. Conflicting evidence about the advantages and disadvantages of both techniques. Further researches are needed to clarify this debate by conducting a properly designed randomized clinical trials.

References

1. BECKER, A. & CHAUSHU, S. 2015. Etiology of maxillary canine impaction: a review. *American journal of orthodontics and dentofacial orthopedics*, 148, 557-567.
2. BECKER, A., KOHAVI, D. & ZILBERMAN, Y. 1983. Periodontal status following the alignment of palatally impacted canine teeth. *American journal of orthodontics*, 84, 332-336.
3. BEDOYA, M. M. & PARK, J. H. 2009. A review of the diagnosis and management of impacted maxillary canines. *The Journal of the American Dental Association*, 140, 1485-1493.
4. BISHARA, S. E. & ORTHO, D. 1992. Impacted maxillary canines: a review. *American Journal of Orthodontics and Dentofacial Orthopedics*, 101, 159-171.
5. BJÖRKSVED, M., ARNRUP, K., LINDSTEN, R., MAGNUSSON, A., SUNDELL, A. L., GUSTAFSSON, A. & BAZARGANI, F. 2018. Closed vs open surgical exposure of palatally displaced canines: surgery time, postoperative complications, and patients' perceptions: a multicentre, randomized, controlled trial. *European journal of orthodontics*, 40, 626-635.
6. BURDEN, D. J., MULLALLY, B. H. & ROBINSON, S. N. 1999. Palatally ectopic canines: closed eruption versus open eruption. *American Journal of Orthodontics and Dentofacial Orthopedics*, 115, 640-644.
7. COULTER, J. & RICHARDSON, A. 1997. Normal eruption of the maxillary canine quantified in three dimensions. *European Journal of orthodontics*, 19, 171-183.
8. CRESCINI, A., NIERI, M., BUTI, J., BACCETTI, T., MAURO, S. & PINI PRATO, G. P. 2007. Short - and long - term periodontal evaluation of impacted canines treated with a closed surgical-orthodontic approach. *Journal of clinical periodontology*, 34, 232-242.
9. GHARAIBEH, T. M. & AL-NIMRI, K. S. 2008. Postoperative pain after surgical exposure of palatally impacted canines: closed-eruption versus open-eruption, a prospective randomized study. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, 106, 339-342.
10. LÖVGREN, M. L., DAHL, O., URIBE, P., RANSJÖ, M. & WESTERLUND, A. 2019. Prevalence of impacted maxillary canines—an epidemiological study in a region with systematically implemented interceptive treatment. *European journal of orthodontics*.
11. NAOUMOVA, J., RAHBAR, E. & HANSEN, K. 2018. Glass-ionomer open exposure (GOPEX) versus closed exposure of palatally impacted canines: a retrospective study of treatment outcome and orthodontists' preferences. *European journal of orthodontics*, 40, 617-625.
12. NORDENVALL, K.-J. 1999. Glass ionomer cement dressing for surgically exposed impacted teeth. *Journal of clinical orthodontics: JCO*, 33, 45-49.
13. NORDENVALL, K. 1992. Glass ionomer cement used as surgical dressing after radical surgical exposure of impacted teeth. *Swedish dental journal*, 16, 87-92.
14. PARKIN, N., BENSON, P. E., THIND, B., SHAH, A., KHALIL, I. & GHAFOR, S. 2017. Open versus closed surgical exposure of canine teeth that are displaced in the roof of the mouth. *Cochrane Database of Systematic Reviews*.
15. PARKIN, N. A., DEERY, C., SMITH, A.-M., TINSLEY, D., SANDLER, J. & BENSON, P. E. 2012. No difference in surgical outcomes between open and closed exposure of palatally displaced maxillary canines. *Journal of Oral and Maxillofacial Surgery*, 70, 2026-2034.
16. PARKIN, N. A., FREEMAN, J. V., DEERY, C. & BENSON, P. E. 2015. Esthetic judgments of palatally displaced canines 3 months postdebond after surgical exposure with either a closed or an open technique. *American Journal of Orthodontics and Dentofacial Orthopedics*, 147, 173-181.
17. PEARSON, M. H., ROBINSON, S. N., REED, R., BIRNIE, D. J. & ZAKI, G. A. 1997. Management of palatally impacted canines: the findings of a collaborative study. *European journal of orthodontics*, 19, 511-515.
18. SCHMIDT, A. D. & KOKICH, V. G. 2007. Periodontal response to early uncovering, autonomous eruption, and orthodontic alignment of palatally impacted maxillary canines. *American Journal of Orthodontics and Dentofacial Orthopedics*, 131, 449-455.
19. SHUKLA, N. K. 2019. Prognostic Factors of Palatally Displaced Canine: A Clinical Review. *Journal of Contemporary Orthodontics*, 3, 20-27.
20. SMAILIENE, D., KAVALIAUSKIENE, A., PACAUSKIENE, I., ZASCIURINSKIENE, E. & BJERKLIN, K. 2013. Palatally impacted maxillary canines: choice of surgical-orthodontic treatment method does not influence post-treatment periodontal status. A controlled prospective study. *European journal of orthodontics*, 35, 803-810.