Management of palatally impacted canines: the findings of a collaborative study

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SUMMARY The impacted palatal canine requires a combination of both surgical and orthodontic management. Two types of approach are commonly used: simple exposure, or exposure with bracketing at the time of surgery. In this study 104 consecutively treated patients with palatally impacted canines were examined at two centres, one at which the ectopic tooth was surgically exposed alone and the other where an orthodontic bracket was bonded to facilitate early traction, and the flap replaced. The aim was to compare the outcome and complication rate for each type of procedure.

In 30.7 per cent of all cases exposed and bracketed a second surgical intervention was required, compared with 15.3 per cent in the simple exposure group. Bracketing, though effective, is a more costly and time-consuming procedure, and it is suggested that simple exposure provides an equally efficient and predictable method of managing the palatally impacted canine with obvious clinical and financial benefits. The long-term periodontal status of the teeth which have been exposed in these two ways, however, needs further investigation.

Introduction

Impaction of the maxillary canine is encountered with a reported prevalence of between 0.9 and 3.3 per cent (Bass, 1967; Moss, 1972). It is estimated that the palatal canine exceeds that of labial impaction by a ratio of at least 3:1 (Fournier *et al.*, 1982). When a canine is labially impacted it may erupt of its own accord, without surgical intervention, when sufficient space has been created. However, palatally impacted canines rarely do so (Jacoby, 1983). Subsequent management may involve either surgical exposure alone allowing natural eruption, or surgical exposure and placement of an auxiliary attachment to facilitate early traction. Bracketing is a well-established and effective method of managing the impacted tooth though it has been criticized for increasing the operating time and being a more technique-sensitive procedure.

The aim of this study was to compare the outcome and complication rate for each type of procedure.

Subjects and method

It is the normal working practice at the two centres examined (centres A and B) for patients presenting with impacted canines to be seen on a clinic attended by both orthodontist and oral surgeon. Where it is decided that the ectopic tooth is to be accommodated into the arch, arrangements are made at centre A for the patient to have the tooth exposed under day case general anaesthesia, which involves removing a window of palatal mucosa and bone overlying the crown. At centre B surgery is routinely carried out under in-patient general anaesthesia with the canine exposed and bracketed with replacement of the mucosal flap. Prior to surgery at centre A an acrylic cover plate is constructed which is used as a dressing for 10 days after surgery. At centre B orthodontic traction is usually commenced within a few months, via a removable 'fish-tail' appliance (Figures 1 and 2), while at centre A the patient is kept under review for 6–9 months in order to allow some
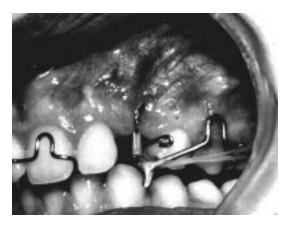
Figure 1 At centre B traction is applied to the ligature hook of the bracketed canine via an elastic onto the roach clasp of the 'fish-tail' appliance.

Figure 3 One week following surgical exposure of the impacted canine at centre A the acrylic cover plate is removed. The tooth is kept under observation for 6–9 months while it erupts spontaneously into the palate.

Figure 2 As the canine erupts a more direct force can be applied onto a bonded attachment. The force and direction of pull can be regulated by adjusting the elastic strength and position of the roach clasp.

Figure 4 Traction is applied initially via a 0.016 in. × 0.022 in. stainless steel 'whip' spring attached to a molar band, anchorage being reinforced by a transpalatal arch.

spontaneous eruption of the canine into the palate before commencing traction (Figure 3). This is usually via a 'whip spring' appliance from molar bands (Figure 4) joined with a trans-palatal arch for anchorage support as described by Roberts-Harry and Harradine (1995), prior to completion of treatment with multi-bracket appliances, as at centre B.

The surgical and orthodontic records of over 50 consecutively treated palatally impacted maxillary canines were examined at each centre. As the cases were consecutively treated the two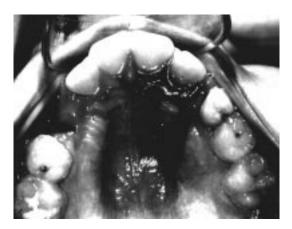 groups were considered similar for the purposes of this investigation. The information collected included the type of surgical approach and anaesthetic employed, and the time taken in the operating theatre to complete the procedure itself. Orthodontically, the treatment mode, the length of treatment and number of visits were recorded. Finally a record was made of any complications, including failure of exposure requiring a second surgical procedure, bond/attachment failure, or failure of eruption. All information was recorded and collated by the same observer.

Table 1 Diagnostic data for centres A and B, respectively.

	Centre A	Centre B
No. of patients	52	52
Mean age (range)	13.9 (10.5–24)	14.5 (11.7–24.2)
Sex	male 20, female 32	male 32, female 20
No. of canines	64	70

Table 2 The collected surgical data for the study.

	Centre A	Centre B
Day stay GA (%/case)	46 (88.4%)	0
In-patient GA (%/case)	6 (11.6%)	52 (100%)
Mean operating time 1 tooth (range)	12 (9–22)	36 (27–43)
Mean operating time 2 teeth (range)	23 (14–33)	41 (33–47)

Table 3 The collected orthodontic data for patients at centres A and B, respectively.

	Centre A	Centre B
Mean treatment time (months)	25.7	21.8
Mean number of visits to completion	18.4	17.7
Mean delay before active treatment start (weeks)	38	11

Table 4 The complication rate for the respective procedures.

	Centre A	Centre B
Tooth covered over, re-exposure	4	
Fractured wire, requiring second procedure		7
Bond failure		3
Failure to erupt, requiring second procedure	2*	6
Extraction	2**	

*One tooth was ankylosed and was later removed.
**One tooth was ankylosed, and one tooth had unacceptable root resorption/periodontal breakdown.

Results

The results are summarized in Tables 1–4. Data were collected on 52 patients at each centre with 30 per cent requiring bilateral exposure with or without bracketing. The mean ages at diagnosis for both centre A and B were 13.9 and 14.5 years, respectively, and were considered equivalent. No statistical differences were found between the male and female data, which were pooled for the purposes of this study (Table 1).

All patients at centre B had surgery under in-patient general anaesthesia compared with only 9 (18 per cent) at centre A (Table 2). The increase in operating time to uncover and bond an attachment to a single tooth is reflected in a mean operating time of 36 minutes (range 27–43 minutes) compared with 12 minutes (range 9–22 minutes) when simple exposure alone was used.

Active orthodontic treatment commenced much earlier at centre B with 71 per cent starting within 12 weeks of the surgical procedure (Table 3). In the simple exposure group the majority waited at least 6 months for the tooth to erupt sufficiently to begin treatment. Mean treatment time at centre A was 25.7 months against 21.8 at centre B, with a similar number of visits (18.4 and 17.7, respectively). However the delay in onset of active orthodontic treatment means that patients at centre A were effectively under management for 6 months longer.

Complications included failure of exposure or eruption requiring a second surgical procedure, bond/attachment failure, or, as in one case from centre A, the extraction of the tooth due to loss of periodontal attachment. The complication rate (Table 4) for those cases which had been bracketed was greater than that for those who were exposed alone. Sixteen patients (30.7 per cent) required a second surgical procedure, compared with 8 (15.3 per cent) of those where simple exposure was employed.

Discussion

This study looked at 52 consecutively treated cases at each of two different centres. The two groups were found to be well matched in terms of age and sex, and were considered equivalent

for the purposes of the study. The mean age of diagnosis at both centres, 13.9 (range 10.5–24) and 14.5 (range 11.7–24.2), supported the accepted view that late referral for impacted canines is common (Shaw, 1985).

Simple exposure can be routinely carried out under day stay general anaesthesia. It is a relatively straightforward surgical procedure incurring only a brief anaesthetic (mean 12 minutes for a one tooth exposure). The longer anaesthetic required to uncover and bond an attachment (mean 36 minutes) has normally to be carried out as an in-patient operation with both medical and financial implications.

The acrylic cover plate used as a periodontal dressing after simple exposure has been criticized as expensive and unnecessary when a sutured pack would appear to be equally effective. However at centre A it is considered worthwhile to reduce operating time and increase patient comfort post-operatively.

The overall complication rate was two times greater in the patients undergoing bracketing compared with those in whom exposure alone was carried out. Only eight cases in total (15.3 per cent) at centre A required a further operative episode in comparison with centre B, where 16 cases in total (30.7 per cent) required further intervention. This was predominantly due at centre B to either a fractured wire from the attachment, or failure of bonding, both requiring a further operative episode under local analgesia. The great disadvantage of orthodontic bracketing, in addition to the longer anaesthetic, is that it is a much more technique-sensitive procedure, which is often carried out under less than ideal circumstances. Factors such as the experience of the operator may play a part and, at centre B it was undertaken exclusively by an experienced surgeon, circumstances which may not be found elsewhere. The problems with the fractured wires could possibly be overcome by using gold chains as described by Hunt (1977)

The mean number of visits to complete orthodontic treatment was similar, being 18.4 at centre A and 17.7 at centre B, with the treatment time at centre A being slightly longer (25.7 months compared with 21.8 months), which was measured from the day the first active appliance was fitted. This is felt to represent an increase in time between visits at centre A which is usually 6–8 weeks. This does not include the 6 month period of review at centre A until the canine has erupted sufficiently into the palate to gain attachment. This effectively increased the overall management time at centre A by more than 6 months and is an obvious disadvantage of the simple exposure approach.

At both centres the outcome of some specific cases was considered unsatisfactory at the end of treatment. At centre A two canine teeth were eventually removed during treatment; one appeared to have ankylosed, and another had an unacceptable level of root resorption and periodontal breakdown. At centre B, two cases took 46 and 71 months to complete.

The results of this retrospective study have led both centres to re-examine and change the accepted protocol for the surgical and orthodontic management of the palatally impacted canine. A prospective study is planned to assess the efficacy of both methods and to examine the outcome of orthodontic treatment with reference to the periodontal status of the aligned canine. While the immediate consequences of these two techniques are easy to assess, long-term periodontal health may outweigh the possible surgical efficiency.

Conclusions

1. Both simple exposure and exposure with bracketing are effective at managing the palatally impacted canine. The use of a ligature wire to facilitate traction is unreliable and it is suggested that a gold chain would be a better alternative.
2. Simple exposure can be routinely carried out under day case general anaesthesia, which has both clinical and financial benefits.
3. A prospective study is suggested to assess the efficacy of both methods and to examine the outcome of orthodontic treatment with reference to the periodontal status of the aligned canine.

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