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SCIENTIFIC SECTION

Management of unerupted maxillary canines where no orthodontic treatment is planned; a survey of UK consultant opinion

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Objective: *To assess current consultant opinion on the management of impacted maxillary canines in patients for whom no orthodontic treatment is planned.*

Design: *Questionnaire survey.*

Method: *Questionnaires were sent to all UK consultant orthodontists identified from the Consultant Orthodontists Group database. Follow-up questionnaires were sent to those who had not replied within 6 weeks. An overall response rate of 76% was achieved.*

Results: *Most consultants were in favor of intervention, with removal of the unerupted canine, although a significant minority suggested a conservative approach. Of the latter group, nearly all recommended radiographic monitoring, but there was little agreement regarding the frequency and duration of this. The risk of root resorption was stated to be the most important factor justifying monitoring.*

Conclusions: *Significant variation was found amongst UK consultant orthodontists with regard to the management of impacted canines, where orthodontic treatment was not planned. The clinical and radiographic features, which the respondents stated would influence their decision to remove or leave the canine, were not those that existing research suggests as being the primary risk factors. It is suggested that, once the patient has passed the peak age for initiation of resorption, a more conservative approach may be appropriate.*

Key words: *Unerupted canines, management*

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Introduction

Numerous articles have been published dealing with the management of unerupted canine teeth.[1–7] Among the treatment options are orthodontic alignment, transplantation or surgical removal of the canine. The latter may be appropriate if the position of the canine is such that either orthodontic alignment or transplantation is not considered appropriate, or alternatively if the patient does not wish to undergo appliance therapy. For this last group of patients most authors advise that there are some instances in which the canine can or should be left *in situ*. Current specialty guidelines[8] also confirm that either removal or retention of the unerupted canine are acceptable alternatives, subject to certain provisions if the tooth is to be left *in situ*. Under these circumstances, radiographic monitoring is recommended as it is acknowledged that unerupted teeth can cause problems, including cystic change of the follicle, resorption of permanent incisors, and resorption of the unerupted tooth itself. Unfortunately, there are few specific recommendations to help choose between these two options in an individual patient and, furthermore, there are no established intervals or durations for radiographic monitoring. Specialist advice and/or treatment for this problem may be required from both orthodontists and oral surgeons. In the UK, a proportion of orthodontic treatment is provided by the consultant service; this is based in hospitals and provides treatment to patients requiring interdisciplinary care. Thus, many patients with impacted canines are referred to consultant orthodontists for advice, but the extent to which they recommend observation or removal, and what influences the decision, is not known. We therefore undertook a survey of UK consultant orthodontists, to ascertain their normal management protocol for unerupted canine teeth, their recommendations for radiographic monitoring, and to determine the factors that influence the decision to recommend observation or removal of the canine in an individual case.

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Materials and method

Postal questionnaires (Appendix 1) were sent to all UK consultant orthodontists, identified from the Consultant Orthodontists Group listing. These were coded simply to allow identification of non-responders. Follow-up questionnaires were sent to those who had not replied within 6 weeks.

Results

A total of 223 questionnaires were sent out and 169 replies suitable for analysis were received, an overall response rate of 76%, although not all respondents had answered every applicable question. Questions 3–10 were not required to be answered by those who stated that they always recommended canine removal, but some nevertheless did so. The number of valid responses to each question is shown in brackets.

Question 1. In your unit, what is the normal mechanism for advising patients initially referred to the orthodontic clinic on alternative options for treatment of unerupted maxillary canines? (164)

In most cases (140), advice was given by the consultant orthodontist alone. Twenty respondents stated that the oral surgeon was involved in a combined decision and two respondents said that they left the decision to the oral surgeon alone.

Question 2. Do/would you usually recommend removal or leaving the unerupted canine in situ*? (164)*

The results are shown in Table 1. The possibility of an association between the consultant orthodontist's decision and the apparent involvement (or otherwise) of the oral surgeon in the decision making process was tested. The first two categories ('always remove' or 'usually remove') were combined into a new category ('intervention') and the three remaining categories grouped together as 'observation'. A Chi-square test, cross-tabulating these categories against reported involvement or non-involvement of the oral surgeon, did not indicate significant differences between the decisions reached. However, exclusion of patients or parents who would normally be asked to decide for themselves, indicated that intervention was less likely to be suggested if the oral surgeon took part in the decision-making process. The intervention and observation groups were also compared (by unpaired Student's *t*-test) to see if there was any difference in the number of years spent in the consultant grade. There were no significant differences.

Table 1 Number of consultants recommending each listed management option

Always or nearly always recommend removal	31
Usually recommend removal	57
Usually recommend leave in situ	42
Always or nearly always recommend leave in situ	14
No specific recommendation: leave patient/parents to decide	22

Question 3. For those canines that you recommend should be left in situ *(or where patient/parent have been given the option to do so), do you recommend periodic radiographic monitoring? (137)*

Most respondents who advised leaving canines under some circumstances also suggested radiographic monitoring. Only a small minority suggested that this would not usually (6) or never (3) be advised.

Question 4. What do you think are the most significant potential problems that justify monitoring? (133)

One hundred and twenty-one respondents considered resorption to be a factor justifying monitoring with 64 ranking this first; 110 respondents also considered cystic change to be of relevance, but only 21 ranked this as the most important factor. Sixteen respondents considered other factors to be of importance. These included the potential for restorative complications (e.g. possible eruption under a prosthesis), movement of the unerupted canine within the alveolus, the age of the patient and medico-legal considerations.

Question 5. Who do you normally suggest should undertake monitoring? (130)

The majority of responses suggested that the referring practitioner should be responsible for monitoring. A small minority (11) considered that this should be undertaken by the hospital department.

Question 6. For how long do you recommend radiographic monitoring? (132)

Indefinite monitoring was suggested by 58 respondents. Twenty-eight considered that monitoring should be undertaken until a patient had reached a certain age, ranging from 16 to 30 years, and 6 respondents suggested that the patient be monitored for a given duration after initial assessment; once again, there was a considerable range (from 12 to 60 months). Forty individuals stated that they would not give any specific recommendation.

Question 7. What interval(s) do you usually recommend between radiographs? (134)

The majority (95) suggested an interval of between 12 and 24 months, 46 suggested more than 24 months and 23 were unspecific. Most respondents only selected one choice of monitoring interval from the list, although it was apparent from the responses that some would vary the interval within the12–24 months time span.

Question 8. If you recommend more than one standard interval please indicate which of the factors below influences your decision (72)

The age of the patient at initial presentation was mentioned by 66 respondents, and the radiographic position of the canine by 56.

Question 9. Do you sometimes recommend an increase in the interval between radiographic examinations for an individual patient? (63)

Forty-seven respondents advised that the interval could be increased when the patient reached a certain age, although there was little agreement as to what this should be (range 13–30 years). A similar level of uncertainty was apparent with regard to a specific period of monitoring after initial assessment. Of the 23 positive responses, some suggested that the interval between radiographs could be increased after as little as 2 years, whereas the maximum suggested was 10 years. Other recommendations included increasing the interval after two to three successive films had shown no apparent change in canine position or at the time of third molar eruption.

Question 10. What factors influence your decision whether to recommend removal or retention of the canine? (133)

Results are presented in Table 2. Some respondents indicated that they would consider certain of these factors as relevant, but did not rank them in any particular order as had been requested. For those that did rank their answers, there was a wide range of variation in the order of ranking for most of the parameters. Other factors mentioned by respondents as being of relevance included existing radiographic evidence of resorption; the presence of other problems that might potentially require surgery; and the patient's dental attendance history.

Discussion

It would appear that there is significant variation between UK consultant orthodontists as to the preferred management for unerupted canines in those patients who are not destined to receive orthodontic treatment. There was a dichotomy between the respondents' decisions as to whether to remove or monitor an unerupted canine tooth. Involvement of oral surgeons in the decision process or the number of years spent in the consultant grade, did not appear to have any influence.

There was more consistency with regard to the need for radiographic monitoring, with most consultants stating that they would advise this because of the possible risk of incisor root resorption, with less importance ascribed to cystic change of the canine follicle. Most respondents felt that the referring practitioner should be responsible for monitoring, and that an interval of 12–24 months between radiographs was appropriate. However, there

Table 2 The rows list the factors in question 10, where respondents were asked to indicate any that they considered to be relevant to their decision to remove or leave an unerupted canine, and to rank the selected criteria in order of importance. The columns show number of respondents who assigned a particular rank order to each factor. The right-hand column lists the total number of respondents who had chosen that particular factor, including those who had omitted to specify the ranking order.

	Rank order									Total
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	
Age	11	13	14	17	7	13	4	1	0	94
Gender	1	1	0	0	1	0	3	22	1	31
Angulation on DPT radiograph	8	7	17	12	6	6	4	0	0	68
Vertical position on DPT radiograph	11	8	18	13	6	5	3	0	0	79
Horizontal position on DPT radiograph	12	7	19	13	8	5	1	0	0	76
Effect on incisors	37	11	9	12	8	3	1	1	0	100
Follicle size	18	38	8	7	10	5	5	0	0	116
Patient preference	12	6	14	9	4	9	18	2	0	87
Other factors	5	2	2	1	4	2	1	1	3	23

was less agreement with regard to the length of time that monitoring should be undertaken, with the majority suggesting that this should be indefinite or alternatively not making any specific recommendation.

When we considered the factors that may influence the decision to advise between observation and removal there was also little agreement These concepts are not supported by the literature.[9–12] It appeared that few respondents ranked age and gender highly in their responses to question 10. Conversely, many ranked follicle size and effects on the position of the adjacent incisors as first or second in order of importance.

The fact that problems may arise could be a justification for removal of unerupted canines. However, the incidence of problems may be relatively low once the peak age for initiation of resorption has passed. We therefore suggest that prospective long-term follow-up of canines that have been left *in situ* is required, to ascertain the true incidence of complications. Until such data is available, it will not be possible to quantify accurately the risks of observation as opposed to intervention. The latter must be acknowledged. It is likely that the majority of impacted canines will be removed under general anesthesia, which in itself carries a measurable risk. The possibility of damage to other tooth roots during surgery and post-operative pain and discomfort should also be taken into account. In this respect, it is interesting to draw a parallel with current recommendations for third molar surgery, namely that such teeth should not be removed unless there are specific indications to do so. This change in practice has occurred because of published evidence, to the effect that the total population morbidity resulting from the routine excision of these teeth exceeds that arising from the removal of those which later develop definite pathology.[13] Although longitudinal data on the behavior of unerupted canines is currently lacking, even current evidence suggests that that there is probably a low incidence of serious complications in older age groups. For patients who have no existing evidence of resorption (assessed by the use of three-dimensional techniques if necessary), and are not judged to be at high risk because of canine angulation or crown position, it is suggested that current specialty guidelines[8] could be amended in favor of monitoring, rather than routine intervention.

Conclusions

1. There is significant variation among UK consultant orthodontists with regard to the management of unerupted canines in those patients who are not considered suitable for or who reject orthodontic treatment.
2. Consultant opinion is dichotomized on whether to remove or retain unerupted canines. Even when retention of the canine is advised, there is little agreement on the frequency and duration of radiographic follow-up.
3. Given the fact that evidence to date suggests a fairly low incidence of complications, once the patient has passed the peak age for the initiation of resorption, a more conservative approach may be justified. Long-term data would be required to confirm or refute this hypothesis.

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Contributors

JWF was responsible for the original concept, initial literature review, questionnaire design, data analysis and first drafting of the manuscript. SKJP was responsible for questionnaire distribution and follow-up, assisting with literature searching and revision, and appraisal of the final manuscript. JWF is the guarantor.

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Appendix

For the purposes of completing this questionnaire, you should assume that:

1. The questions relate to unilateral impaction of a maxillary canine.
2. The patient declines, or is unsuitable for, active appliance therapy.
3. There is NO radiographic evidence of root resorption affecting adjacent permanent teeth at the time of examination.
4. Reimplantation (even if technically possible without prior orthodontics) is NOT an option.
5. Except for Question 1, you, as the orthodontist, have to make the decision.

1. In your unit, what is the *normal* mechanism for advising patients initially referred to the orthodontic clinic on alternative options for treatment of unerupted maxillary canines?

- Advice given by Consultant Orthodontist.
- Advice given by Consultant Oral Surgeon.
- Combined decision (e.g. made at joint consultation appointment).
- No specific advice given; leave to referring practitioners to decide for themselves or to seek further opinion.
- Other (Please specify.....)

2. Do/would you usually recommend removal or leaving the unerupted canine *in situ*? *(Tick one only)*

- Always or nearly always recommend removal. *(If so, please go to question 11)*
- Usually recommend removal.
- Usually recommend leave *in situ.*
- Always or nearly always recommend leave *in situ.*
- No specific recommendation: leave patient/parents to decide.

3. For those canines that you recommend should be left *in situ* (or where patient/parent have been given the option to do so), do you recommend periodic radiographic monitoring? *(Tick one only)*

- Always or nearly always.
- Usually yes.
- Usually no.
- Never or almost never. *(If so, please go to question 10)*

4. What do you think are the most significant potential problems that justify monitoring? *(Please rank all those you consider relevant in order of importance)*

- Resorption of incisor roots.
- Cystic change of canine follicle.
- Other (please specify .....)

5. Who do you normally suggest should undertake monitoring? *(Tick one only)*

- Hospital department
- Referring practitioner (or original GDP if referred by orthodontic specialist)

6. For how long do you recommend radiographic monitoring? *(Tick one only)*

- Indefinitely.
- Until patient reaches a certain age (if so please specify usual age .....)
- For a given time period after assessment (if so, for how long .....)
- No specific recommendation.

7. What interval(s) do you usually recommend between radiographs? *(You may tick more than one but please see questions 8 and 9 below)*

- Less than 12 months.
- From 12 up to 24 months.
- More than 24 months.
- No specific recommendation.

8. If you recommend more than one standard interval please indicate which of the factors below influences your decision. *(You may tick more than one box. Please OMIT this question if you only recommend one standard interval between radiographs)*

- The patient's age at initial presentation.
- The radiographic position of the canine.

9. Do you sometimes recommend an increase in the interval between radiographic examinations for an individual patient? *(You may tick more than one box. Please OMIT this question if you never recommend changing the interval between radiographs)*

- Yes, when the patient reaches a specific age (if so, please state age .....)
- Yes, after a specific period of monitoring (if so, for how long? .....)

10. What factors influence your decision whether to recommend removal or retention of the canine? *(Please indicate rank order of all those factors you consider relevant)*

- Patient age.
- Patient gender.
- Angulation of canine crown on DPT radiograph.
- Vertical position of canine crown on DPT radiograph.

- Horizontal position of canine crown on DPT radiograph.
- Clinically apparent effects of canine on position of adjacent incisor(s).
- Size of follicle on DPT radiograph.
- Patient/parental preference.
- Other (please specify .....)

Please indicate year of appointment to the consultant grade .....