MASTEROPPGAVE

Variation among examiners in early detection of palatally displaced maxillary canines, using visual inspection and palpation.

A pilot study

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Abstract

Objective: The aim was to study inter-examiner variation in detection of palatally displaced maxillary canines by using the palpation method, and to examine how different dental health care personnel evaluate the need for X-ray when ectopic eruption of maxillary canines is suspected.

Materials and Methods: The subjects comprised 52 ten-year-olds (104 canines). Four investigators (2 dental students, dental hygienist and orthodontist) examined each patient by visually inspecting and palpating the developing maxillary canines into 4 categories according to the position of the non-erupted canine. The need for control radiograph to confirm the diagnosis was also included in the examination. The results were registered in a scheme. The statistical analysis was performed using kappa-analysis for interrater agreement. Sensitivity and specificity were calculated using the orthodontist as a gold standard.

Results: When evaluating canines as palpable or not palpable the interrater agreement coefficient (κ_{free}) was 0.78, indicating substantial agreement. Pair-wise interrater-agreement on palpation of the maxillary canines was low, -0.04-0,25, indicating poor to fair agreement. The agreement on need for further radiographic examination when ectopic eruption was suspected was (κ_{free}) 0.49, which indicated moderate agreement. Sensitivity was clearly lower than the specificity.

Conclusions: The results suggest that palpation method among the examiners of this study seemed more reliable in diagnosing normally erupting canines, while detection of palatally displaced canines may not be reliable enough. Experience may affect the prescription of radiographs in favor of fewer radiographs with the more experienced examiners.

Introduction

Of all human teeth, the maxillary canine has the longest period of development and the most devious eruption path. Its final position in the occlusion is essential to complete the arch form, a functional occlusion and symmetry and harmony of the dentition (1). The maxillary canine is the most frequently impacted tooth except from third molars (1-3). The reported incidence of canine impaction varies from 0,8 to 5,2 percent in normal populations (2-8). Bilateral impaction is seen in 17 to 45 percent of the cases (8), and impacted canines are more common in females than males (2, 8, 9). The reported percentages of palatally impacted canines, varies between 41 percent and 93 percent among studies (10-16). Most of the palatally impacted canines (85 percent), have sufficient space for eruption into the dental arch (17).

Ectopic eruption of maxillary canines can cause damage to the dentition, the most frequent adverse effect being root resorptions of adjacent teeth. In addition bone loss, gingival recession, cyst formation, and malposition of teeth are possible negative effects of the ectopic eruption of maxillary canines (4). Resorption of the roots of the maxillary permanent incisors has been reported in 12 percent of cases of ectopic eruption of maxillary canine in the age group 10 to 13 years using conventional 2D radiographic examination(13). When using CT scanning technique the detection of root resorptions of incisors adjacent to ectopically erupting maxillary canines was substantially increased and in the study by Ericson and Kurol (2000), resorptions on the incisors were seen in 48 percent of children with impacted canines (18). Resorptions can be seen as early as the age of 9, but are most commonly seen in the age groups 11 to 12 years or later (18, 19).

Two common theories may explain the phenomenon of the palatally impacted canine, but the exact etiology of impacted maxillary canines is not yet known. The “guidance theory of palatal canine displacement” suggests that palatal displacement is a result of local factors such as lack of guidance along the root of the lateral incisor due to congenitally missing lateral incisors, supernumerary teeth, odontomas, transposition of teeth, or other mechanical destining factors that influence the eruption path of the canine (20-22). The second theory for canine impaction is known as “the genetic theory”. In this theory palatal impaction of canines has been found to be related to congenital absence of teeth, and is suggested to be of the same genetic origin (23). In addition, there are some factors that are thought to cause canine impaction such as obstacles, abnormal position of tooth bud, dental crowding, long and complicated path of eruption, late eruption date, early loss of deciduous canine, prolonged retention of the deciduous teeth, and systemic disease (4, 17, 24, 25). Palatally impacted maxillary canines are often present along with other dental abnormalities including tooth size, shape, number, and

structure; hypoplastic enamel, infra-occluded primary molars and aplastic second bicuspids (5, 26).

According to Jacobs (1999) there are three main methods for localization of the permanent canine: Visual inspection, palpation and radiographic examination (27). A bulge at the alveolar crest in the buccal sulcus is usually present 1 to 1,5 years before the eruption of the canine (28). The bulge is a sign of a normally erupting canine and may be present already at the age of 8 and should be palpable in the buccal sulcus generally at the age of 10 (9, 29). If the permanent canine cannot be palpated during that time, it may be a sign of a developing eruption disturbance (29). The axial position of the adjacent lateral incisor may be influenced by the eruption of the canine (29). This may be a normal physiological process;"ugly-duckling" but it can also be an indication of ectopic eruption of the canine. If the deciduous canine is mobile, it generally is a sign of the permanent canine erupting normally, although some exceptions may occur. However, the permanent canine may erupt ectopically even in cases showing varying degree of deciduous canine root resorption; ectopic eruption of permanent maxillary canines has been reported in cases with less than 1/3 of the root of the deciduous canine remained (13). Based on findings from visual inspection and palpation, Ericsson and Kurol (1986) have suggested the following indications for radiographic control when eruption disturbances are suspected: 1. Asymmetry on palpation, 2. The canine cannot be palpated in a normal position at the expected time, 3. The lateral incisor is late in eruption or shows a pronounced buccal displacement or proclination (29). According to these criteria further radiographic examination was indicated in 12,8 percent of 10 year olds (29).

In cases with normal space conditions and no incisor root resorption early treatment of palatally erupting canines by extraction of primary canines has been suggested as the treatment of choice in young individuals. Ericson and Kurol (2000) reported that 78 percent of 46 palatally ectopic erupting maxillary canines showed improved position 12 months after extraction of primary canines. (30) Baccetti et al. (2011) reported in a randomized-controlled clinical trial that rapid maxillary expansion (RME) and/or transpalatal arch (TPA) therapy in combination with deciduous canine extraction showed even better results on the eruption of palatally displaced canines compared to extraction of deciduous canine only (31). A randomized-controlled clinical trial by Bonetti et al. (2011) reported a greater chance of spontaneous tooth eruption into the dental arch with concomitant extraction of both deciduous canines and first molars, than with extraction of only deciduous canines (32). In cases with a late diagnosis, or where extraction of primary canines does not lead to spontaneous correction, the recommended approach for treating impacted maxillary canines is surgical exposure, followed by treatment using orthodontic appliances (4).

Treatment of impacted canines remains a challenge to clinicians and the patients. Early diagnosis and detection of palatally displaced maxillary canines is very important and can prevent root resorption of adjacent teeth, impaction, save treatment time and expenses from more complicated treatment in the permanent dentition (33). Palpation and visual inspection of maxillary canine teeth before their eruption is a standard clinical procedure for early detection of palatally displaced maxillary canines in growing children. However, this early diagnosis method may be disposed to some subjectivity leading to variation in the interpretation of the results between the professionals carrying out the examinations. To our knowledge, no studies have been available so far on the reliability of the implementation of clinical palpation method between different examiners.

Aims of this study

1. To study the inter-observer variation among examiners representing different dental professional groups in detecting palatally displaced maxillary canines by using the palpation method
2. To examine how different dental health care personnel evaluate the need for X-rays after visual inspection and palpation when evaluating potential palatal displacement of maxillary canines.

Subjects and methods

Participants

The clinical screening was performed at a Public Dental Clinic in Tromsø during August 2012. The subjects comprised 52 patients (104 maxillary canines), 25 girls and 27 boys. The subjects were 10-year-olds from the area (born 2002), who were recalled for their annual dental examination. All patients received a letter informing about the study prior to the examination. The parents were asked to reply by email if they rejected to join the study. Both the subjects and their parents were also asked if they wanted to participate in this clinical study at the day of examination. Of the 57 patients recalled, 4 did not show up and one patient rejected to join the study.

Methods

The investigators were two dental hygienists working in a public dental clinic, two 5th year dental students from the University of Tromsø and one orthodontist from Tannhelsetjenestens

Kompetansesenter for Nord-Norge (Tknn). The dental hygienists had 4 and 6 years clinical experience and the orthodontist had 13 year experience as dentist, including 6 years as orthodontist. Prior to the examinations the dental hygienists were introduced to the project, including information about the prevalence of maxillary canine impaction, the method of palpating the maxillary canines, and indications for further radiographic examination when there was a risk of canine impaction. All five operators received this information prior to the study.

Only one investigator was present in the room at a time. Each patient was first examined by a dental hygienist, then the dental students and at last the orthodontist. To maintain the integrity of the comparison data, investigators did not see each other's evaluations.
Each investigator examined eruption of the canines by visual inspection and palpation. The results were registered in a scheme (Appendix). The position of the canines was categorized as follows:
a. Palpable in a normal position, defined as a bulge localized in the buccal sulcus in the maxilla apical to the root of the deciduous canine. Erupted canines were categorized as palpable normal.
b. Palpable in abnormal position, if the intraosseous position of the canines was either mesial or distal to the normal eruption path.
c. Not palpable normal; the canine was not palpable but the general occlusal development was considered later than normal.
d. Not palpable abnormal: The canine bulge was absent and this was considered abnormal related to the occlusal development. A palatally displaced canine were suspected.

Since the aim of the study was to find out the interexaminer agreement in using the palpation method for screening palatally displaced canines, the 4 categories were combined into 2 (=palpable / not palpable) for the statistical analysis. The categories not palpable normal and not palpable abnormal were linked to represent the canines that were not palpable.

After palpation of the canines, the investigators evaluated if there were indication for further radiographic examination due to eventual canine impaction. Radiographs recommended due to the buccally palpable but displaced canines were also included in our registration scheme. The orthodontist made the final decision on the need for radiographic examination regarding eruption of permanent maxillary canines.

There was no time limit set for each examiner to perform the palpation test. The dental students and the orthodontist were each examining 52 patients. Intending not to interrupt

with the patient recall lists, the two dental hygienists examined different patients, but in the statistical analysis their results were combined to represent one operator.

Statistical analysis

Data from the clinical examination were analyzed using a multi-rater variation of Brennan and Prediger's free-marginal kappa (κ_{free}). To calculate a chance-adjusted measure of agreement the Online Kappa Calculator (34, 35) was used. Inter-rater agreements between two raters were calculated using version 19.0 of the SPSS software package (SPSS inc., Chicago,IL,USA). The kappa values vary between -1 and 1. Higher value indicates better agreement. Multirater κ_{free} was chosen as our primary statistical analysis because raters distribution of cases into categories are not restricted; raters do not know a priori how the cases are distributed in each category (35, 36). The interpretation of kappa values was done using a common cited scale (table 1) (37). Percent overall agreement (P_O) was calculated using the Online Kappa Calculator (34). The percent overall agreement is a measure of agreement among raters, which does not take into account that the raters are expected to agree solely by chance. Confidence Intervals were calculated using Vassar Stats online calculator (38). Sensitivity and specificity were calculated for the other raters using the orthodontist as a gold standard. The diagnostic accuracy was measured using sensitivity and specificity. Sensitivity = (true positive)/ (true positive + false negative) = probability of being test positive when a diagnosis is present. Specificity = (true negative) / (true negative + false positive) = probability of being test negative when a diagnosis is absent (table 2) (39). Sensitivity and specificity give values between 0 and 1, a higher value indicates a better diagnostic accuracy compared to a gold standard.

Table 1
Interpretation of kappa values

Kappa	Agreement
< 0	Less than chance agreement
0.01–0.20	Slight agreement
0.21– 0.40	Fair agreement
0.41–0.60	Moderate agreement
0.61–0.80	Substantial agreement
0.81–0.99	Almost perfect agreement

Table 2
Sensitivity and specificity

	Disease present	Disease absent
Test positive	a (True Positive)	b (False Positive)
Test negative	c (False Negative)	d (True Negative)
	Sensitivity: a/ (a+c)	Specificity: d/ (b+d)

Results

Distribution of the results of the clinical examination according to each operator is shown in Table 3. The orthodontist reported the highest amount of palpable canines. 101 out of 104 canines (97 percent) were categorized as palpable whereas for the other operators it varied from 93-97 canines (89-93 percent). Number of canines categorized as not palpable varied from 3-11 (3-11 percent).

The percent overall agreement on palpation (palpable/not palpable) of 104 maxillary canines (52 patients) was 89 percent, with the interrater agreement coefficient, κ_{free} 0,78 (ci= 0,63-0,88), indicating substantial agreement (Table 4). The agreement on the need for further radiographic examination because of assumed ectopic canines was moderate (75 percent) (Table 4). Out of the 104 maxillary canines, all four operators consistently agreed that the canine was palpable in 83 cases (80 percent). For the remaining 21 canines at least one operator disagreed if the canine was palpable or not.

Pair-wise inter-rater agreement (Cohen's kappa) on palpation of the maxillary canines was 0,25 between the orthodontist and the student examiners indicating fair agreement. For the orthodontist and the dental hygienists a less than chance agreement was found (κ_{Cohen}= -0,04) (Table 5). Best agreement (κ_{Cohen}= 0,29) was found between the two dental students, although this also indicated no better than fair agreement.

The number of children the operators felt needing a control radiograph varied from 11-15 patients (Table 6). Both the orthodontist and the dental hygienists evaluated 11 patients (21%) in need for x-ray, while the dental students stated 14 and 15 (27 and 29 percent respectively) in need for further radiographic examination. Although the number of suggested further radiographic examinations did not vary considerably among the examiners, the agreement regarding individual subjects varied much more. In only 2 out of 52 subjects all four raters agreed that radiographs were indicated. The pair wise kappa value between the orthodontist

and the dental hygienists indicated moderate agreement (Table 6). For the two dental students only slight agreement was found in prescribing radiographs ($\kappa_{Cohen=}$ 0,09).

Total agreement, where all operators agreed to either take a radiograph or not, for the same patients, were found in 28 subjects (53,8%). For 26 subjects (50%) at least one of the examiners would take a radiograph. The reliability between all examiners in assessing the need for radiographs indicated moderate agreement (Po 74,2% and κ_{free} 0,48) (Table 4).

Using the orthodontist as a reference gold standard, the sensitivity and specificity for palpation and indication for radiographic examination for each operator was determined (Table 7). Sensitivity (=the proportion of not palpable canines which were correctly identified) was clearly lower than the specificity (=the proportion of palpable canines which are correctly identified). Sensitivity was 0,00 for one of the operators and 0,67 for the other two. Specificity was better among all operators, ranging from 0,91-0,93 (Table 7).
Sensitivity and specificity regarding need for further radiographic examination varied from 0,45-0,64 and 0,78-0,88 respectively (Table 7).

Table 3
Distribution of clinical results in palpation of the maxillary canines according to each operator
(op1=dental student 1, Op2=dental student 2, Op3=dental hygienists, op4=orthodontist)

N=104 (2 categories)	Op1		Op2		Op3		Op4	
Palpable	93	89%	93	89%	97	93%	101	97%
Not palpable	11	11%	11	11%	7	7%	3	3%

Table 4
The percent overall agreement (Po) and interrater agreement coefficient (κ_{free}) on palpation and evaluation of need for further radiographic examination *κ-free=* Multirater reliability *for interrater agreement*

	Overall agreement Po %	Free-marginal kappa κ free (confidence interval)	Interpretation of Kappa
Palpation 104 canines (palpable/not palpable)	89%	0,78(0,63-0,88)	Substantial agreement
Palpation 104 canines (4 categories)*	78%	0,71 (0,60-0,81)	Substantial agreement
X-ray 52 cases	75%	0,49(0,27-0,73)	Moderate agreement

*1:Palpable normal, 2:Palpable abnormal, 3:Not palpable normal, 4:Not palpable abnormal

Table 5
Agreement and disagreement in the palpability of the maxillary canines between the orthodontist and each operator *(Op1=dental student 1, Op2=dental student 2, Op3=dental hygienists)*

	Operator 1		**Operator 2**		**Operator 3**		Total
Orthodontist	Palpable	Not palpable	Palpable	Not palpable	Palpable	Not palpable	
Palpable	**92**	9	**92**	9	**94**	7	101
Not Palpable	1	**2**	1	**2**	3	**0**	3
Total	93	11	93	11	97	7	104

Cohen's Kappa values and confidence intervals:
Orthodontist/Op1=0.25 (0-0,69)
Orthodontist/Op2=0.25 (0-0,69)
Orthodontist/Op3=-0.04 (N/A)

Table 6
Agreement and disagreement between the orthodontist and the other raters in evaluation of need for further radiographic examination (*Op1=dental student 1, Op2=dental student 2, Op3=dental hygienists)*

N=52	**Operator 1**		**Operator 2**		**Operator 3**		Total
Orthodontist	No X-Ray	X- Ray	No X-Ray	X-Ray	No X- Ray	X-Ray	
No X-Ray	**33**	8	**32**	9	**36**	5	41
X-Ray	4	**7**	6	**5**	5	**6**	11
Total	37	15	38	14	41	11	52

Cohen's Kappa values and confidence intervals:
Orthodontist/Op1=0,39 (0,09-0,69)
Orthodontist/Op2=0,21 (0-0,55)
Orthodontist/Op3=-0,42 (0,10-0,74)

Table 7
Sensitivity and specificity of palpation of canines and evaluation of the need for radiographic examination among the students and dental hygienists compared to the orthodontist as a gold standard.

Operators	*Palpable or not palpable canine* Sensitivity(n=3)/Specificity(n=101)	*Need for X-ray* Sensitivity (n=11)/Specificity(n=41)
Dental stud. 1	0,67/0,91	0,64/0,80
Dental stud. 2	0,67/0,91	0,45/0,78
Dental hygienists	0/0,93	0,55/0,88

Discussion

Our results suggest substantial interrater agreement (κ_{free}) on palpation the position of unerupted maxillary canines in general, and moderate agreement in determination on need for further radiographic examination of 10-year-olds. On the other hand, pair wise kappa values on palpation were poor, indicating less than chance agreement between the dental hygienist and the orthodontist in early diagnosis of an impacting maxillary canine, and fair agreement among the other rater pairs.

According to evidence, in most cases where the canine bulge is absent, the canine displacement is palatal (28). The results suggest that diagnosing of eventual palatal impaction of maxillary canines was lacking consistency especially regarding cases with absence of the canine bulge. All the canines the orthodontist categorized as not palpable, were not identified as not palpable by the other raters. This is reflected as the clearly lower sensitivity, while the specificity was high. The dental hygienists showed a lower sensitivity compared to the dental students. Considering the orthodontist as a reference, our results indicate that early diagnostic skills regarding palatally displaced canines by the students and the dental hygienists need improvement.

Ericson and Kurol (1986) found in their study that 71 percent of 10-year-old patients have either bilaterally erupted canines, unilateral erupted canine with normal palpable contralateral or bilaterally palpable canines (29). In comparison, this study showed that most canines (80 percent) in 10-year-olds were palpable or erupted. These results are not directly comparable because Ericson and Kurol refer to number of patients, while we refer to number of canines.

Radiographic examinations should always be based on indications from a clinical examination. The general practitioners are responsible for evaluation of occlusal development to assess the need and indication for radiographs (40). Ericson and Kurol (1986) estimated the total percentage of children in the age group 10 year needing oral radiographic examination because of canine eruption to be 13 percent (29). In our study the recorded need for radiographic examination for the children in the age group 10 year was somewhat higher (21 to 29 percent). Clinical experience may influence the frequency in prescribing radiographs, in favor of fewer radiographs for the most experienced. The least experienced raters in this study prescribed more radiographs than the more experienced raters. They also showed poorest agreement among the rater pairs according to pair wise kappa. Since in about half of the patients, at least one of the operators would have taken an x-ray, this shows that early diagnosis of palatally impacted canines is perhaps not enough emphasized during studies of the dentists and dental hygienists.

Impaction of maxillary canines can often be prevented by early diagnosis followed by extraction of the primary maxillary canines (4, 9, 30). Also root resorption of maxillary permanent incisors caused by canines is more commonly seen after the age of 10, which makes it important to monitor the eruption of permanent canines at this age (13). Broadway and Gosney (1987) found that 60 percent of the patients with impacted maxillary canines had not been detected and referred to the oral surgery services until the patient was at least 14 years of age (41). It may be that ectopic erupting canines are missed by many general dental practitioners and onset of interceptive treatment or referral to specialist may therefore be

delayed. To avoid the adverse effects of impacted canines, we suggest that 10-year-old children should be examined by experienced oral health care personnel or that the existing oral health care personnel need more knowledge of this topic and/or should be calibrated. Studies report better agreement when oral health care personnel are calibrated (42).

This study can be criticized for the design of the 4 different categories, which possibly influences the κ_{free} results. The definitions of the different canine position categories turned out somewhat subjective in practice. The canines that had erupted at the time of screening were also included as palpable normal. These canines should rather have been excluded from the results, since the palpation test is meant to monitor unerupted maxillary canines. Unfortunately, the erupted canines could not be separated afterwards from the registrations. Therefore, the erupted canines are likely to have biased the results by overestimating the agreement in the number of palpable canines. The category not palpable normal was chosen most on the basis of Ericson and Kurols studies, which concluded that radiographic examination is not indicated in 10-year-olds with not palpable canines and late occlusal development (29). However, interpretation of "late occlusal development" without further specifications given, turned out too subjective to be reliable in this study setting. The palpable abnormal category could also be refined, to specify the abnormal positions. Since the different categories of this study were not clearly defined prior to the screening, a distinction between palpable and not palpable canines was chosen to be more adequate for most of the statistical analyses.

The κ-value is widely used for interrater reliability studies, although there is no universally accepted value for good agreement (43). Kappa is a measure of true, chance-corrected agreement and for this reason we chose κ_{free} over P_O (percent overall agreement). Multirater κ_{free} was considered more suitable than Fleiss multirater kappa, because Fleiss kappa would be influenced of the non-even distribution of data in this study. Unlike Fleiss kappa, multirater κ_{free} does not vary as a function of marginal distributions (35). As few categories as possible were chosen, because more categories than are theoretically justified will spuriously inflate the value of multirater κ_{free} (35).

Cohen's kappa (κ_{Cohen}) calculates the interrater agreement among rater pairs. This kappa value is influenced by the distribution of data in the categories, especially in agreement on palpation. In our study, most of the canines were palpable, which gave a non-even distribution of the results in the statistical analysis. Since Cohen's kappa is most suitable for results that are normally distributed, our analysis of pair-wise interrater agreement could be criticized, and the κ_{Cohen} results are less suitable as compared to the results of multirater κ_{free}. As for evaluations

of the need for x-rays, the results were not in the same extent as for palpation non-evenly distributed and are thus more reliable. Nevertheless, the purpose of using Cohen's kappa analysis was to see if there were differences among the various oral health care personnel with different educational background when interpreting the canines, not to find consensus among them.

In our study, the clear weakness of using kappa statistics is that this method reflects the agreement on the palpation method, but it does not reflect the purpose of the most important aspect; to detect those canines that truly are palatally displaced. For this reason, we chose to calculate the sensitivity and specificity, although the shortcoming in this matter is the lack of true evidence for the canine position since radiographs is considered non-ethical to verify the accurate position of all canines.

A clear shortcoming of this study was that due to circumstances, the two dental hygienists screened only half of the subjects each and the data was combined to represent one examiner. Especially since they were not calibrated before the clinical screening, the results regarding dental hygienists are not straight comparable with the other examiners and should be interpreted with caution. Also, the individual differences among these two raters were not taken into account.

The major limitation of the present study was the small number of clinicians of the chosen professional groups who were involved, and also the limited number of patients, especially because the incidence of palatally impacted maxillary canines are low, not more than a few per 100 children. It would also have been beneficial to assess the intraobserver agreement of the clinicians. The intraobserver agreement was not estimated in our study because it would have required extra visits for the children and their parents. Another aspect of this study that can be criticized is that the orthodontist was used as gold standard, instead of verifying the true position of the canine with radiographs afterwards. However, taking extra radiographs on research purposes only was not considered relevant. For future studies calibration of the examiners could state if the variation in the detection of ectopically erupting canines are more reliable.

The study suggests that different dental personnel may assess the risk of palatal impaction of unerupted maxillary canines differently. This leads to differences in diagnosis, prescription of x-rays and probably different treatment of the patients. However, due to the small sample and some methodological deficiencies, the results of this study cannot be generalized. Rather, our study could serve as a pilot study for a more comprehensive study with a bigger sample.

Conclusions

- Among the examiners in this study the palpation method seemed to be reliable for diagnosing the position of normally erupting canines, while the detection of palatally displaced canines seemed to be rather poor.
- Experience may influence prescription of radiographs by decreasing the number of control radiographs with the more experienced personnel.
- A more thorough study with a larger sample and more observers are recommended to identify the quality of early diagnosis of palatally displaced canines.
- We suggest more education of oral health care personnel in early diagnosis of palatally displaced canines.

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Appendix

Registration scheme

Examiner:

Coded number for patient:

Right side (1.quadrant)

Palpable?

Yes — No

If yes — *If no*

Normal position Abnormal position — Normal Abnormal

Left side (2.quadrant)

Palpable?

Yes — No

If yes — *If no*

Normal position Abnormal position — Normal Abnormal

Need for **further radiographic examination**?

Yes No