ISSN 2219-6749

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The Journal of Forensic Odonto-Stomatology

Volume 5, n. 2 - Dec 1987

OFFICIAL PUBLICATION OF THE
INTERNATIONAL ORGANIZATION FOR
FORENSIC ODONTO-STOMATOLOGY

The Journal of

Forensic Odonto-Stomatology

Contents

Pink Teeth of the Dead: 1. A Clinical and Histological Description

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Abstract

The findings of 21 cases with post-mortem pink teeth are described. Causes of death were drowning, burning, knifing and unknown. In the majority of cases all the teeth were equally pink but in some the colour of the anterior teeth was more prominent. In two instances the two sides of the jaws differed, in one the teeth of one side were markedly lighter and in the other one side showed no staining. Staining is always confined to the dentine. The enamel, cementum, radicular sclerosed dentine, secondary dentine and the dentine on which secondary dentine has been laid down are spared. Pulps of pink teeth vary from bright red to dark brown and in the majority of cases pulpal discolouration is confined to the crown and only that dentine adjacent to the discoloured pulp has taken up the pigment. In our series it seems that the pink teeth were mainly caused by accumulation of blood in the pulps due to pooling in the head and neck region.

Keywords: Pink teeth, post-mortem.

Introduction

The "pink teeth" phenomenon in corpses and skeletons, although a rarity, is now well known in forensic odontology. The cause is, however, still enigmatic although three common denominators are evident: unnatural death, exposure after death to humid surroundings and the causative pigment appearing to be haemoglobin, a derivative of haemoglobin or a breakdown product of haemoglobin.[1–6]

One of the unexplained aspects of this phenomenon is that the pattern of colouration among teeth seems to vary.

It would appear that the first person to describe post-mortem pink discolouration of teeth was Thomas Bell of Guy's Hospital in 1829.[1] He stated: "I have frequently examined the teeth of persons whose death has been occasioned by hanging or drowning and have almost invariably found the whole of the osseous part (i.e. dentine) coloured with a deep red .... In both instances the enamel remains wholly free from discolouration".

The next detailed description of pink teeth and the pattern of staining was by Miles *et al.*[2] who documented their findings about the teeth of two bodies, an exhumation and a drowning. They found that the

crowns of the majority of the teeth were pale pink and that the colouration involved the roots as well but diminished in intensity towards the apices. Not all the teeth were equally affected and even adjacent teeth differed in intensity of staining. The pulps of the teeth were pink and gelatinous and the stain extended for variable distances to the surfaces of the teeth. In the roots the stain was patchy and extended in most places through about one third of the thickness of the dentine. In one tooth the stain penetrated into the enamel.

Beeley and Harvey[1] noted pink teeth in 5 cases: 3 drownings (35 - 40 days, 90 days and 30 days after death), a buried shot victim, 94 days after death, and a death from barbiturate poisoning with vomit in the trachea, discovered 46 days after death. They investigated the teeth of 4 cases and found that the crowns were pale pink while the roots had a deep pink colour. The pulps were deep pink-red and some unstable pink colouration was present in the hard tissues of the teeth.

Kirkham *et al.*[4] reported 10 cases where post-mortem discolouration of teeth was evident after 24 hours to 4 months. The colour of the affected teeth varied from pink to grey-black with the roots of teeth a darker shade of pink than the crowns and the anterior teeth generally more intense in colour than the molars. The number of teeth affected was variable but at least in 4 cases all the teeth were stained. The remains of the pulps were red, yellow-brown and yellow-grey and the dentine surrounding the pulps was stained diffusely pink or red.

Clark and Law[6] also found that the staining of teeth differs and noted that in 2 of their cases "there were teeth completely free of discolouration with pink teeth on either side. These unpigmented teeth were incisors."

During routine forensic odontogical services which require age determination of all unidentified bodies and skeletons, a number of cases with pink teeth have been encountered. This paper reports the clinical and histological appearances of teeth removed from these bodies.

Materials and Methods

Since October 1985 200 unidentified corpses, among which were 21 with pink teeth, were examined.

Recordings carried out at the mortuary included colour photographs of the mouth, documentation of teeth present and teeth that were obviously pink. When deemed necessary biopsy specimens were taken of the gingivae, alveolar bones and tongues. Teeth were removed in every case and where possible included an upper central incisor, a premolar and a molar. All specimens were fixed in 70% alcohol and on arrival at the laboratory were re-photographed. At least one tooth from each case (often more) was then divided and ground sections prepared. Excessive heating was avoided by sectioning with a rotary Isomet* saw at low speed and cooling in 70% alcohol.

*Buehler Ltd, Illinois, USA.

Results

The causes of death of the 21 cases were as follows: 9 were due to drowning at sea, 5 due to fire of which 4 were by the necklace method, 3 to knifing and 4 bodies were too decomposed to establish the cause of death. The bodies of those who died on land were found in shallow graves (the necklace murders), under rubble (death due to fire) and on open ground. The periods after death varied from 5 to 6 days and longer. All the bodies, except where death was caused by fire, had undergone obvious decomposition. One corpse was completely skeletonized.

Drowned cases. All the teeth exhibited a pink hue. In four of these the surrounding gingivåe and alveolar bones were also pink. One had a markedly red tongue and the face and upper torso were blue-black while the rest of the body retained its normal, fair tone.

Fire victims. Due to the oral and facial destruction by fire, there was some difficulty in recording the extent of the pink discolouration of teeth. Those teeth that could be inspected, however, were pink. In two of the necklace victims where the teeth escaped destruction, the anterior teeth were pinker than the posteriors.

Rest of victims. The bodies were in various stages of decomposition and the teeth revealed varying degrees of pinkness. In one instance the teeth on the right side were noticeably more pink than the left (Fig. 1) while in another the left teeth were stained and the right not (Fig. 2).

The colour of the teeth ranged from a light pink-red to dark portwine red. The discolouration was the most marked in the roots, diminishing

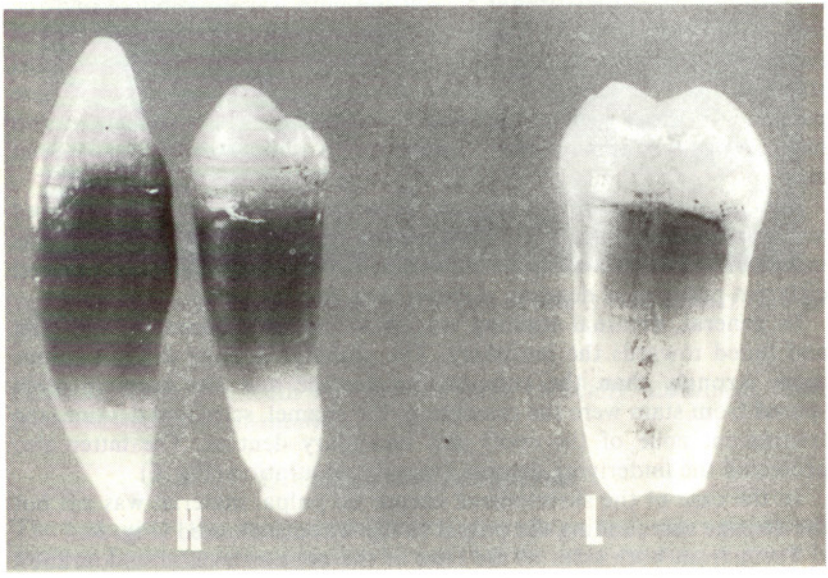

Fig. 1. A right canine and premolar (R) are more intensely stained than the molar (L) on the left side. Also note the absence of discolouration from the apices of the teeth.

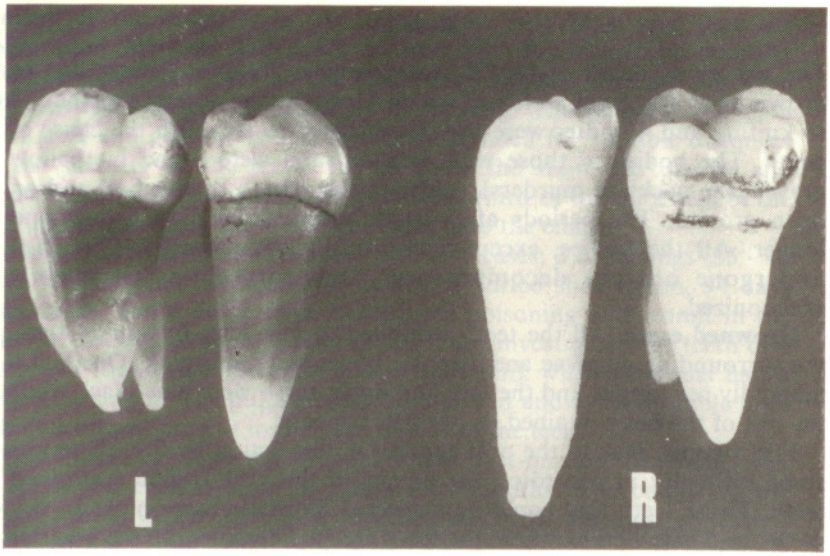

Fig. 2. In this instance the teeth on the left side (L) were stained while the teeth on the opposite side (R) were free from pigment.

in intensity towards the apices (Fig. 1). In most cases the apices were clear and the area corresponded to the translucent zone.

The ground sections revealed a diversity of staining patterns. The pulp remnants, when present, were bright red to dark brown. In the majority of cases the coronal part of the pulp was discoloured and the root section not (Fig. 3), although there were two examples where the radicular pulps were more prominently stained (Fig. 4). Bright red pulps still had discernable pulpal features, and channels (blood vessels?) were present. In cases where the pulp had changed to dark brown no morphology was apparent and it appeared as a homogenous discoloured mass.

A noticeable feature was that only dentine adjacent to the discoloured areas in the pulp stained, with the result that the coronal dentine was more often affected than the radicular dentine (Fig. 3). It also caused different patterns of dentinal staining (Fig. 5).

In general, dentinal staining was most intense adjacent to the pulp and faded towards the periphery. The globular dentine did not colour more strongly than the surrounding dentine and the areas in teeth spared from stain were the cementum, the enamel, sclerosed dentine (the translucent zone of the root) and secondary dentine. The latter also protected the underlying dentine from discolouration (Fig. 6).

In the case of the skeletonized corpse no pulpal material was left but the dentine surrounding the pulpal cavity was discoloured (Fig. 5).

Teeth from both sides of the jaws of the asymmetrical discolouration cases were examined and in the case of the one-sided lesser pigmentation, these teeth duly contained pigment, although less, while in the other

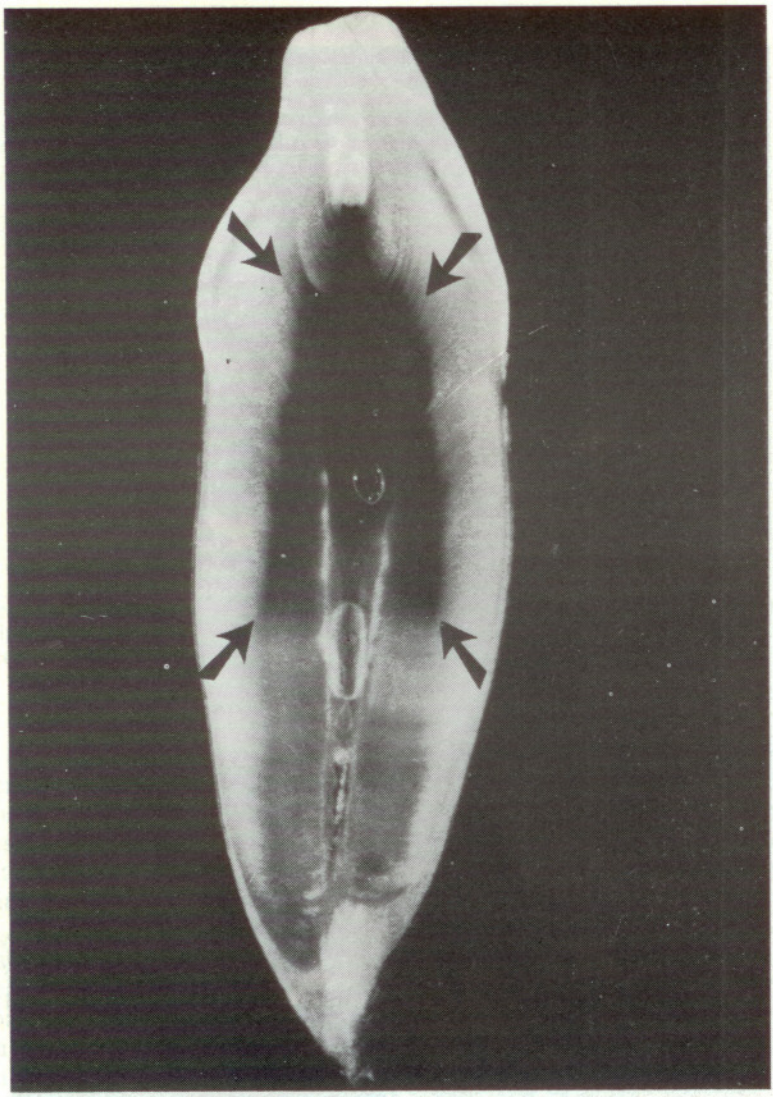

Fig. 3. An example of staining arising from the coronal pulp (ground section). Note the white unstained zone in the dentine. (See Fig. 6.)

example where the teeth on one side were clinically unstained, these teeth showed no pigmentation.

Discussion and Conclusions

The findings of this study are in general accordance with other published work in finding microscopical evidence that the stain-causing pigment is blood derived, that it is found in cases of unnatural death and that it is related to humidity.

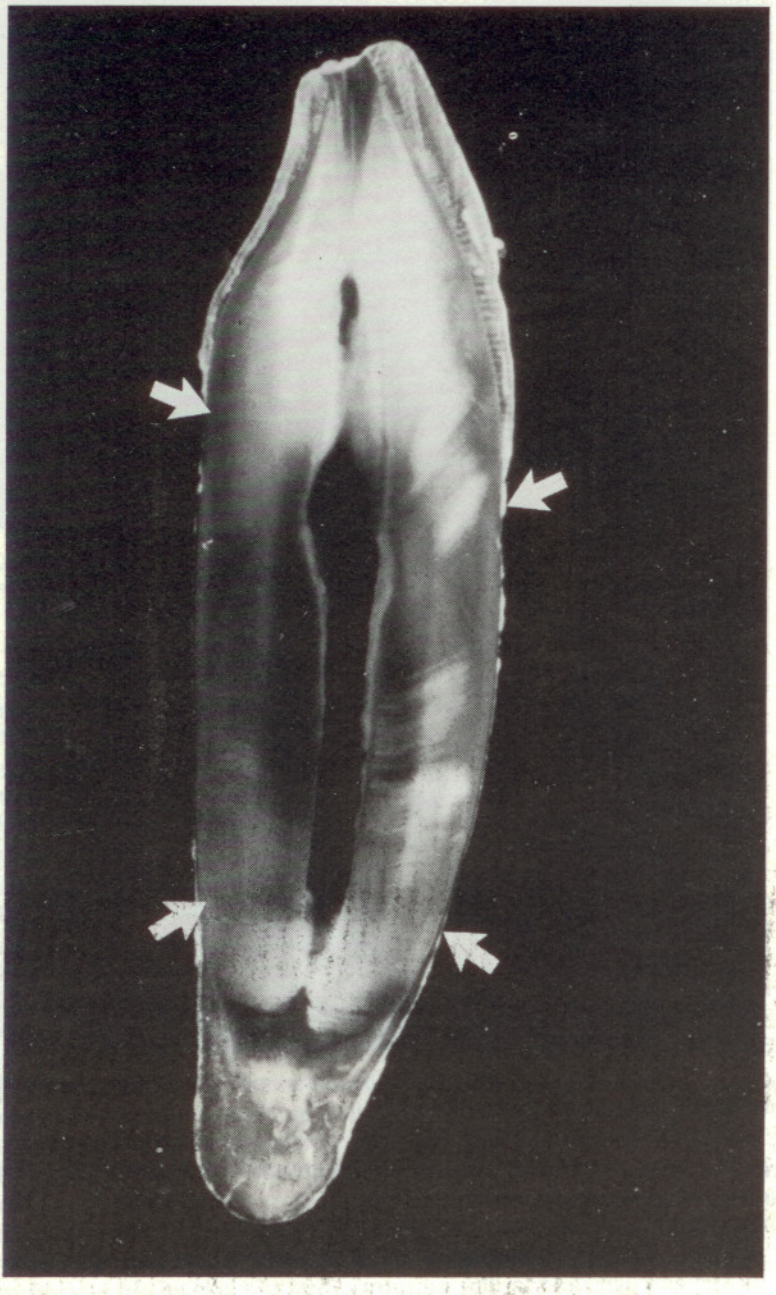

Fig. 4. An example of staining arising from the radicular pulp. Note that the upper part of the coronal pulp is free from discolouration (ground section).

Fig. 5. An illustration of the patterns of staining that can be encountered. Note that the pulp of one of the teeth is empty but that the surrounding dentine is stained (ground section).

Its red colour indicates that it may be haemoglobin or haemoglobin-derived. It is therefore logical to assume that haemolysis of red cells must first take place, the pigment is released and autolysis of blood vessels allows the fluid pigment to seep to the dentine where it diffuses into the dentinal tubules. If this hypothesis is true then staining of teeth can only take place at some interval after death.

Although it cannot be assumed that pink teeth are not found after natural death it seems likely that only in sudden, usually unnatural death does blood maintain its fluidity as a result of an inhibition of the coagulation process or an activation of fibrinolysis. The blood in the pulp can therefore remain fluid long enough for the sequence of events set out in the previous paragraph to take place.

The need for a humid environment in the development of pink teeth also seems logical as in this series drownings accounted for significantly more cases with pink teeth than any other form of death. Indeed, every unidentified drowned body seen by the author has had pink teeth which seems to support the contention that humidity prevents the drying of the pulp which would otherwise eliminate seepage of the pigment.

The pattern of staining in pulps and the dentine can be explained on morphological grounds. The coronal pulp is larger and more vascular and will therefore collect more blood. It is also evident that dentine staining adjacent to the pulp will be more intense and that peripheral dentine is spared because seepage of the pigment through the tubules becomes physically more difficult the further it is from its source.

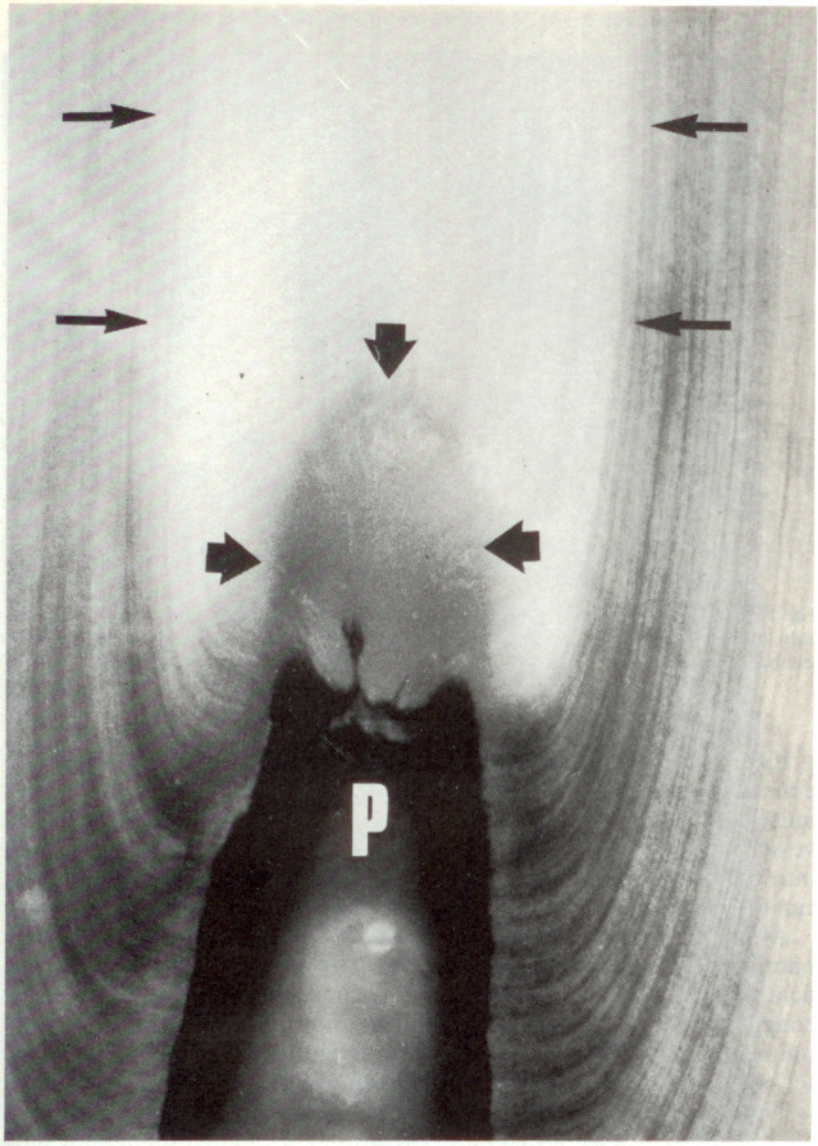

Fig. 6. An example of unstained secondary dentine (broad arrows) and the unstained dentine on which it is deposited (narrow arrows) (P = pulp) (ground section).

The dentinal tubules in the translucent zone of the root are almost obliterated by calcium salts deposited in the tubules. The pigment cannot penetrate this dentine just as secondary dentine which has fewer tubules than primary dentine, will allow only limited ingress of the pigment. As the secondary dentine seals the primary dentine on which it is deposited it also escapes staining by the pigment.

Enamel, like translucent dentine, is too dense to allow entrance of stains into its structure. Cementum on the other hand is spared because pigments usually do not reach the cementodentinal junction and the junction is possibly also sealed by the intermediate layer of the dentine.

A matter that is difficult to explain is the uneven staining of teeth in a body. Some of our cases displayed pink gingivae and alveolar bones which we believe are due to pooling of blood in these tissues. This was vividly illustrated in the drowning with the blue-black face and upper torso. Drowned bodies float with the head in a low position, allowing blood to gravitate to the head and neck[8] which could also presumably collect in teeth.

Earlier it was mentioned that the anterior teeth of necklaced victims were pinker than the posteriors. It is reported that these victims were found face down in their graves and could it be that blood has collected in the anterior facial area?

It is therefore reasonable to assume with Whittaker *et al.*[3] that the phenomenon of pink teeth may at least partly be analogous to the post-mortem "livid stain" which is produced by flow of blood into a dependent part after death. This may explain the two cases in which the staining of the teeth differed on both sides of the jaws. If the body was on its side after death, the teeth on that side would stain more intensely due to pooling of blood.

Excessive accumulation of blood in the pulps of teeth can be produced by strangulation, be it accidental, by executional hanging[2,9] or murderous intent.[10] This too will lead to the formation of post-mortem pink teeth.[2,10]

Neither of the above hypotheses, however, explains the pattern of discolouration encountered by Clark and Law[6] where the molars of a corpse were stained but not the incisors. A careful study of the anatomy of such teeth may reveal the reason.

Acknowledgements

I wish to express my sincere thanks to Prof. G. J. Knobel of the Department of Forensic Medicine of the University of Cape Town and to my colleagues Dr. A. Padayachee, Profs. C. J. Thomas and C. J. Nortjé. A special word of thanks must go to Mr. C. L. Maree, Mrs. A. E. Swanson and Mrs. A. Sadler of the Department of Oral Pathology of the University of Stellenbosch who spent many hours preparing the material for this investigation.

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Gender and Ethnic Differences of the Radiographic Image of the Frontal Region

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Abstract

Standardized radiographs of 60 adult black patients (30 female, 30 male) were compared with an identical number of patients from the Cape Coloured ethnic group. Features examined included sinus height, sinus width, perimeter, number of edge loculations, inter-orbital distance and sinus area. Measurements were compared between races and sexes using Student's t-tests. Male frontal sinuses were significantly greater in both supero-inferior and mediolateral dimensions and possessed a significantly greater number of edge loculations ($p < 0,05$). Inter-orbital distance was greater in the black racial group when compared with Cape Coloureds ($p < 0,05$) and sinuses were absent in 6,7% of blacks and only 1,7% of Cape Coloureds. The differences between racial groups and sexes were insufficient for definitive identification purposes.

Keywords: Frontal sinus, radiology, forensics.

Introduction

The frontal sinus bud is present at birth in the ethmoid region but is not radiographically visible until the 5th year of life. Its purpose is presumed to be to buttress the facial bones or contribute to speech resonance.[1] Asherson[2] studied a large number of non-standardized occipito-mental radiographs and, concluding that no two sinuses were alike, proposed that a frontal sinus radiograph, "the frontograph", would be a useful means of identification. A similar study performed with standardized views has supported this hypothesis.[3] Turner and Porter[4] described differences in the frequency and degree of frontal sinus pneumatization in different population groups. Their findings indicate that absence of the frontal sinuses was common in "mixed races" compared with so-called pure races. The purpose of the present study was to establish possible differences in the frontal sinuses between different racial groups and between the sexes. Furthermore, if differences were to exist, this investigation sought to establish whether they would be useful as a means of person identification.

Materials and Methods

Thirty female and 30 male individuals from the black and Cape Coloured population groups were analysed in this investigation. Standardized

postero-anterior skull radiographs of consecutive patients (which were required for treatment purposes) were exposed in the same manner in a cephalometric unit with identical focus/film and film/patient distances (Figure 1). The radiographs were developed in the same automatic processor and were assigned random numbers.

Analysis of the frontal sinus region was performed by quantification and subjective observation. The latter consisted of determining the presence of a radiographically visible metopic suture and frontal sinus decussation, as well as ascertaining the number of edge loculations (total, that is around the full perimeter of the sinus, and on the superior edge only of both frontal sinuses) and assessment of the relative size of the frontal sinuses. Two examiners inspected the blinded radiographs independently.

Quantification included measurement of the perimeter, total area, height and width of the frontal sinuses and inter-orbital width. The perimeter was calculated using a standard map distance measuring device (Figure 2). The area was obtained by tracing the image of each frontal sinus outline onto a sheet of processed, unexposed radiographic film, cutting and weighing the tracing and then reading the area on an area/weight regression line (Figure 3). The regression line ($r = 0{,}96$) was created from weighing known area cut-outs of film and plotting the two by means of the equation $y = 0{,}064 + 40{,}124(x)$.

The method for determining the sinus height and width was similar to that used by Schuller.[5] The mid-sagittal plane was used as a landmark and the maximum sinus height was defined as the greatest supero-inferior distance of the frontal sinus parallel to this plane. Sinus width was defined as the maximum distance from the left lateral margin of the sinuses to the right lateral margin of the sinuses perpendicular to this

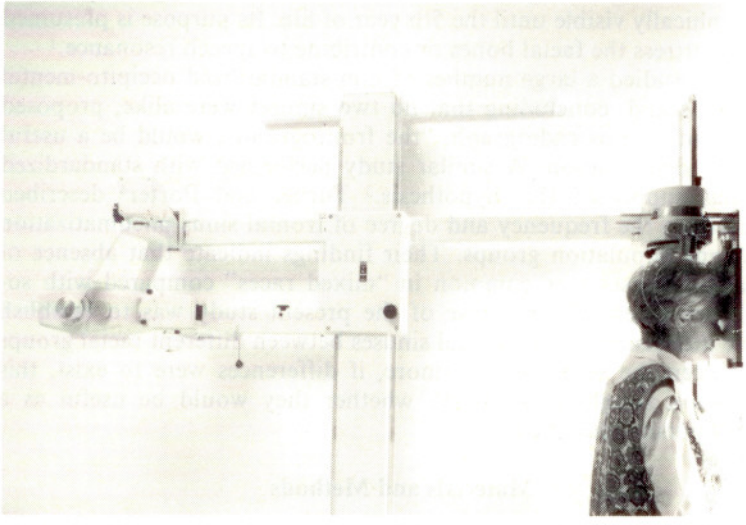

Fig. 1. Patient positioned for production of standardized postero-anterior skull radiograph.

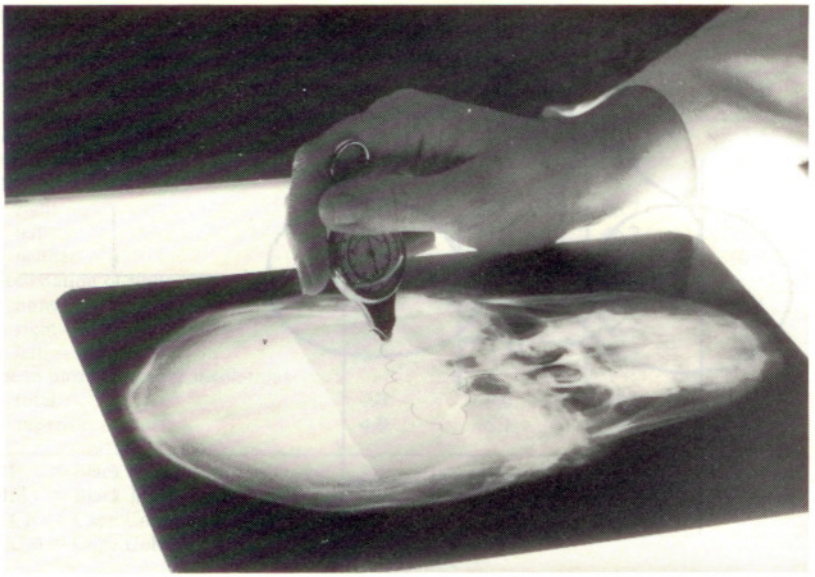

Fig. 2. Method of frontal sinus perimeter measurement using standard map-reading measuring device on tracing of the radiographic image of the frontal sinus.

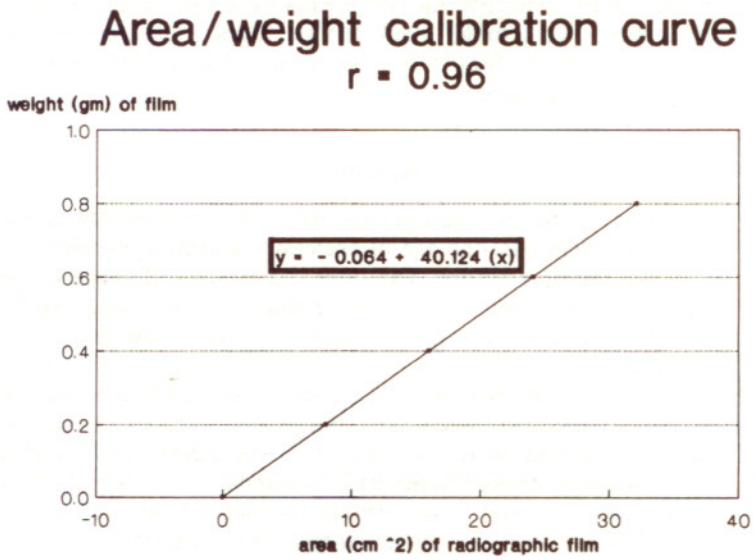

Fig. 3. Calibration curve for conversion of film weight to sinus area (cm^2).

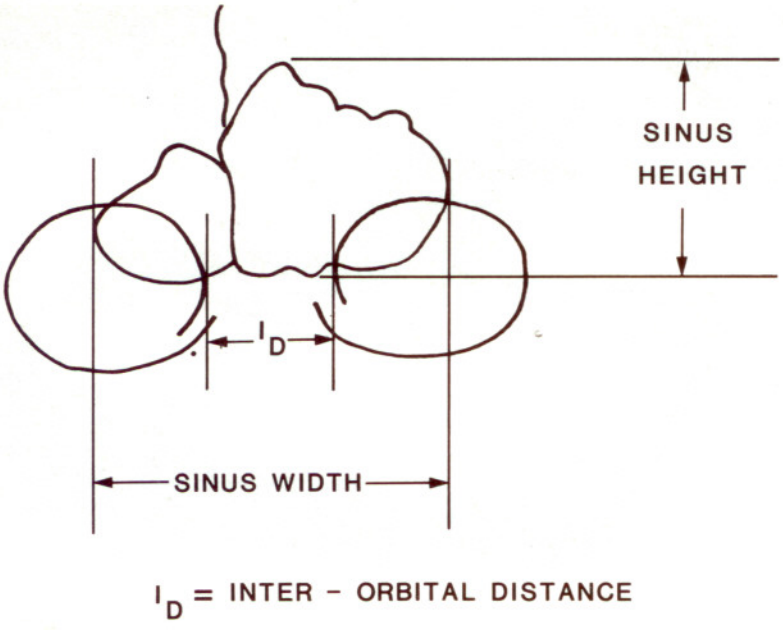

Fig. 4. Method of analysis of sinus height, width, and inter-orbital distance on tracing of standardized postero-anterior radiograph.

mid-sagittal plane. Inter-orbital distance was defined as the horizontal distance (perpendicular to the mid-sagittal plane) between the most medial aspects of the boney orbits (Figure 4).

The means of the objective measurements were calculated for each of four sub-groups: black male, black female, Cape Coloured male and Cape Coloured female. Statistical inter-group comparisons were then made using Student's t-tests.

Results

The mean ages of the four sub-groups were not significantly different and all patients were past the age of skeletal maturation as seen by the absence of the metopic suture. The only significant difference between the sub-groups was in black males and females where males exhibited significantly more total and superior edge loculations than females ($p < 0,05$) (Table 1).

Measurements of the frontal sinus shadow showed that there was a tendency for all males to have larger sinuses than females (Table 2). In particular, sinus height, width, and area in black males and sinus height and width in Cape Coloured males were statistically significantly greater than in females ($p < 0,05$). Inter-orbital distance was greater in blacks ($p < 0,05$). Black males had greater inter-orbital distances than black females and both had greater inter-orbital distances than their Cape Coloured counterparts ($p < 0,05$).

Table 1. Radiographic features of the frontal region in patients of different gender and ethnic group

	BF	*BM*	*CCF*	*CCM*
absent sinus (%)	10,3	3,1	0	3,3
visible metopic suture	0	0	0	0
dominant sinus (%)				
right	27,6	34,4	26,7	23,3
left	55,2	21,9	46,7	60,0
neither	6,9	40,6	26,7	10,0
decussation of sinus				
none	73,1	96,8	80,0	58,6
right — left	11,5	3,2	6,7	13,8
left — right	15,4	0	13,3	24,1
mean number of edge loculations				
total	7,0	9,0	7,6	9,1
superior	4,0	5,1	4,5	5,1

BF = Black Female
BM = Black Male
CCF = Cape Coloured Female
CCM = Cape Coloured Male

See text for description of significant differences

Table 2. Measurements of radiographs of the frontal sinus region in patients of different gender and ethnic group

	BF	*BM*	*CCF*	*CCM*
mean perimeter (mm)	13,2	15,1	13,0	15,3
	*(6,3)	(6,6)	(4,2)	(7,3)
mean height (mm)	21,8	29,0	26,0	30,1
	(10,7)	(11,9)	(10,8)	(10,9)
mean width (mm)	44,2	55,4	46,9	58,3
	(22,8)	(20,5)	(14,6)	(19,2)
mean area (cm^2)	7,5	10,8	9,0	11,3
	(4,8)	(8,2)	(4,9)	(7,2)
mean inter-orbital	26,2	28,5	24,6	25,5
distance (mm)	(3,2)	(4,0)	(2,3)	(4,1)

BF = Black Female
BM = Black Male
CCF = Cape Coloured Female
CCM = Cape Coloured Male

See text for description of significant differences
*1 standard deviation in parentheses

The correlation of frontal sinus height and width was 0,96, indicating proportional growth in lateral and vertical dimensions.

Discussion

Schuller[5] reported that female skulls had smaller and more numerous edge loculations and in this study the blacks but not the Cape Coloureds

showed a similar trend. Brown *et al.*[6] studied the longitudinal growth of the frontal sinus in white patients and concluded that the sinus height was greater in males than in females. In a study of 111 adult Ukrainians, Nikityuk[7] found that the male sinuses were generally of greater dimensions, but there was a high variability in size not connected with gender. The increased size of male sinuses was also evident in both racial groups in the present study. In this investigation, as in others[3,7,8] there was considerable variability in the radiographic size of the frontal sinus. For this reason the use of frontal sinus size for identification can only have marginal application in sexing a corpse. Indeed, frontal sinus size may be related to environmental factors. Koertvelyessy[9] studied the frontal sinuses of 153 Eskimo crania and concluded that the degree of pneumatization correlated positively with the degree of environmental coldness in which the population lived. Many other conditions are known to affect sinus morphology.[10]

Gulisano *et al.*[11] correlated the sinus height and width and obtained a correlation coefficient of 0,95 which is very close to the value obtained in the present study. This indicates that growth in both supero-inferior and lateral directions is related. They also found a high degree of asymmetry (50,8% examined were symmetrical) which differed from the current study where few cases crossed the midline and there was a tendency for the left sinus to be larger than the right (except in black males). Others have reported the right sinus to be dominant.[5] Asymmetry may also be partially dependent on skull-shape with brachycephalics and dolichocephalics having a greater frequency of asymmetry than mesocephalics.[11] Cranial indices were unfortunately unavailable in this study so similar relationships in these population groups could not be established. Asherson[2] found that 5% of individuals had no radiologically detectable frontal sinuses and Turner and Porter[4] reported that absence of the frontal sinus was said to be more common in mixed than in "relatively pure races". The data in the current study do not support this claim since blacks were more likely to have absent sinuses than Cape Coloureds (although the frequencies were low).

Inter-orbital distance was significantly greater in blacks than in Cape Coloureds for both males and females. Once again, however, overlap between the racial groups precluded the use of this radiographic measurement as an identification feature.

As in most dentally related identification procedures, the availability of an ante-mortem record is vitally important. So too, the existence of an ante-mortem radiograph of the frontal sinus matched with the same view from a deceased person can be the only way of making a definitive identification.[3] If no ante-mortem radiographs exist however, it seems unlikely that any radiographic feature of the frontal region can serve as an indicator of either the corpse's sex or race. On the other hand, tendencies such as increased number of loculations in males and increased inter-orbital distance in blacks could prove useful as ancillary information if coupled with more definitive methods of identification.

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Age Determination in a Living Individual — A Case Report

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Abstract

A case is presented where age determination in a living individual could not be effected by removal and sectioning of a central incisor tooth. An approximate age was derived from ulna/radius epiphyseal ossification, skull suture, spheno-occipital synchondrosis and third molar eruption, apical closure and general occlusal attrition. Because age at the time of an accident was a critical factor and the individual concerned had no documentary evidence of his age a compensation claim for loss of a leg was being contested by an insurance company. The case never went to court as the evidence of age presented by the forensic odontologists proved to be sufficiently convincing.

Keywords: Age, living person, sutures, ossification.

Introduction

Age determination of the dead by means of the teeth is a well accepted procedure which although widely practised does not at present deliver an accurate result. It is dependent ideally on obtaining a maxillary central incisor tooth which, after sectioning and the quantification of five features, produces a total score which is related to a certain age when read on a regression line.[1]

An adapted regression line which differs considerably from the caucasian line has been established for blacks in South Africa.[2]

In the living where teeth cannot be extracted at will this method of aging is not applicable. It is then possible to resort to tooth eruption times,[3] root apex,[4,5] ossification sites[6] and closing of sutures[7,8,9] as an indication of age, although the latter is not reliable. Keiser-Nielsen[10] states that above 23-24 years, age determination becomes increasingly difficult.

Case Report

Mr. C. N. is a young black man (Fig. 1) who was hit by a motor car while crossing a street in 1974. As a result of his injuries he suffered amputation of the left leg but did not lay an insurance claim until 8 years later. The individual had no records to prove his age but guessed that he was 24 years old. The insurers raised, by way of a special plea, the plea of prescription of the claim on the basis that he was allegedly

Fig. 1. Mr. C.N., a black man from Grahamstown, Cape.

already a major when his claim was prosecuted. Although the plaintiff prosecuted his claim late the defence attorneys maintained he was still minor at the time of the accident and not subject to the provisions relative to prescription. It was thus of paramount concern to determine the plaintiff's age as accurately as possible and to relate it back to the time of the accident.

Investigations Carried Out

The Teeth. In an otherwise intact dentition tooth 27 was carious (Fig. 2) and unrestorable for various reasons, among which the socio-economic circumstances of the subject and the briefness of the visit to the dental hospital. It was thus decided to extract it with a view to age determination by means of ground section. Unfortunately the roots were narrow and curved and the very carious crown was lost during the extraction procedure rendering this exercise fruitless.

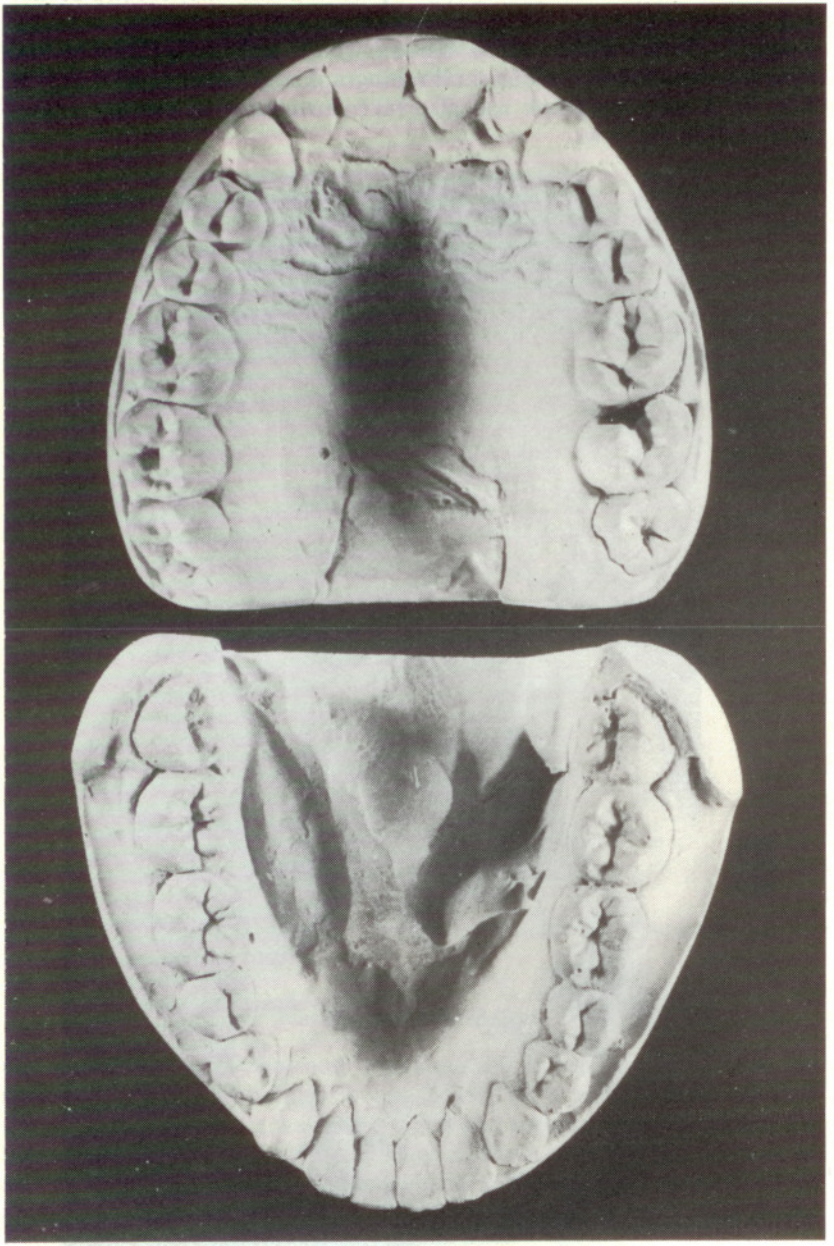

Fig. 2. Casts of the dentition show carious tooth 27, amount of attrition and state of eruption of the third molars.

Attrition was evaluated on casts of the teeth and proved to be minimal and consistent with that of a person in the early second decade (Fig. 2).

Apical closure of the third molars which were fully erupted was observed on a lateral oblique skull radiograph and found to be complete (Fig. 3). A pantomograph was also taken to obtain an overall view of the dentition and jaws.

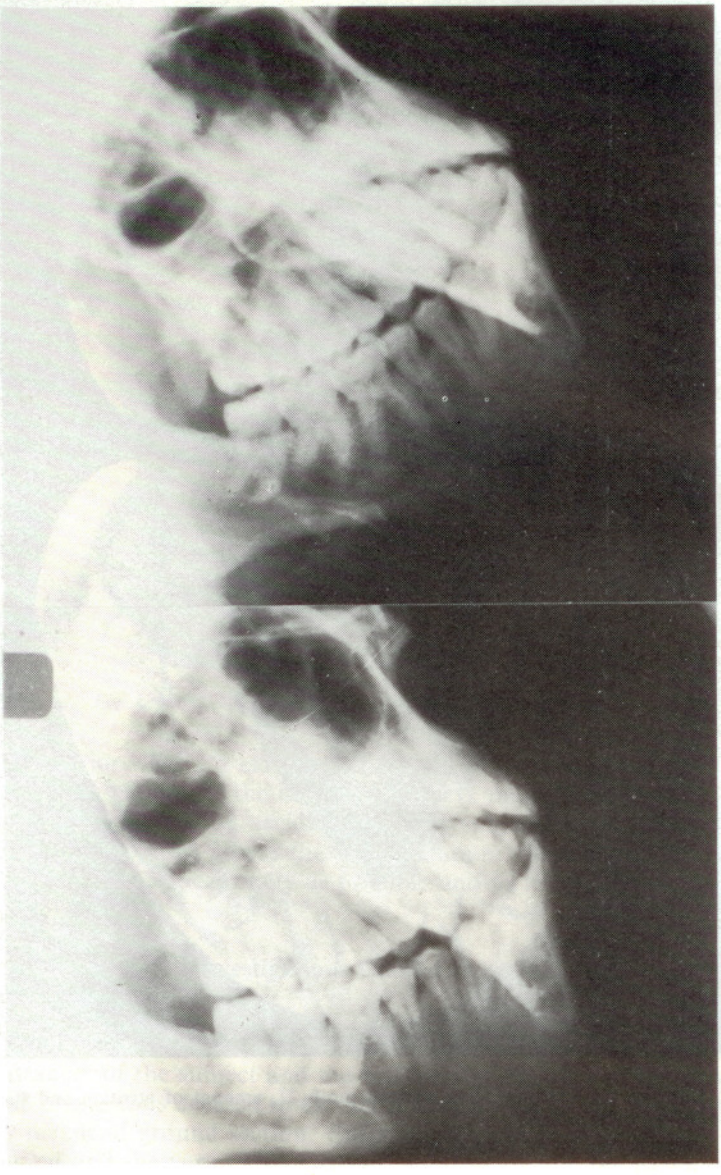

Fig. 3. Apical closure of third molars is shown as complete.

Sutures and ossification sites

Suture closure and ossification were investigated in the following radiographs: hand/wrist (Fig. 4), cephalograph (lambdoid sutures) (Fig. 5) skull postero-anterior (interparietal sutures) (Fig. 6), skull infra-cranial (spheno-occipital synchondrosis) (Fig. 7).

Fig. 4. A hand/wrist radiograph shows complete ossification of the epiphysis.

Results and Discussion

On an infra-cranial view and cephalograph it was apparent that the spheno-occipital synchondrosis was closed, on a postero-anterior view the inter-parietal suture was partly open and seen on a cephalograph the lambdoid sutures were still open. Since all these sutures begin to close at about 20 years and close completely at a higher age this method of aging is unreliable but in this case could indicate an individual in the second decade of life.

The wrist epiphyses were all well ossified and indicated an age of at least 20 - 23 years.

The third molars were fully erupted and the apices as seen on lateral oblique, apical and pantomographic radiographs were well closed. Since they close 3 years after eruption, which could take place between 18 and

Fig. 5. A cephalograph reveals that the lambdoid sutures are open.

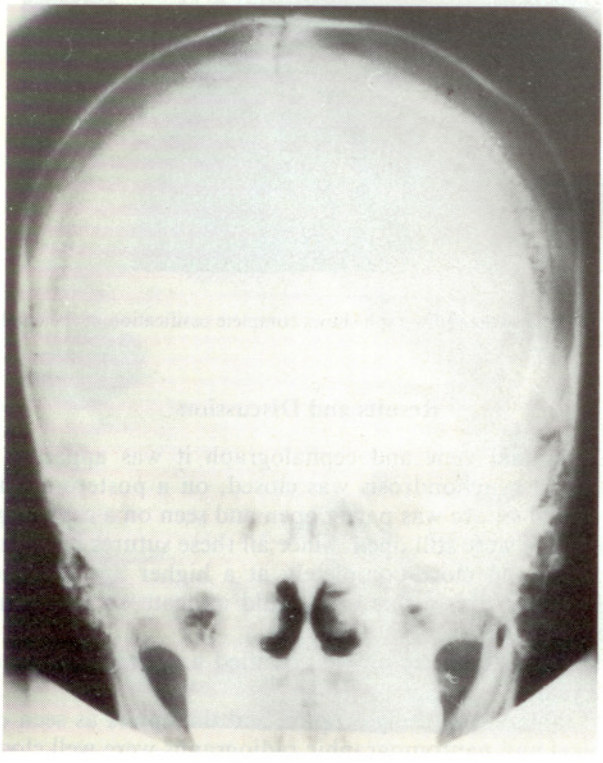

Fig. 6. The inter-parietal suture is seen to be open in a postero-anterior view.

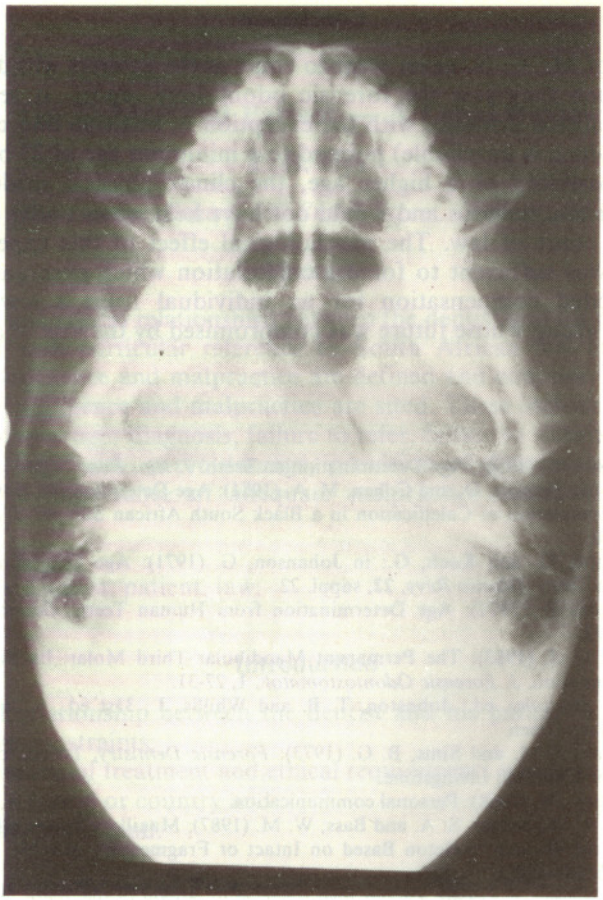

Fig. 7. The spheno-occipital synchondrosis has closed (infra-cranial view).

21 (in caucasians) and 17-20 (in negroes), as in this case, the individual must have been at least 20 years old.

It would have been ideal to use Gustafson's (modified Altini for blacks)[2] criteria but it was not possible to obtain an incisor tooth. The one grossly carious molar whose crown was destroyed in the extraction and whose roots were irregular and curved could not be utilized for aging.

The casts of the teeth were useful in studying attrition which was found to be light particularly on the first molars which usually display the heaviest wear. This does not exclude the possibility of a non-abrasive diet found among urbanised Africans but it is unlikely that, taking the unsophisticated nature of the individual into consideration, he would have had a consistently refined diet.

It is therefore likely that the individual's stated age of 24 is correct and that in 1974 he was 16 years old **and thus a minor.**

Conclusion

The case of Mr. C. N. never went to court as the insurers withdrew their action when they saw the forensic odontology report. It seems that although all the evidence with the exception of attrition and closure of sutures (which is unreliable) pointed to a minimum age of 23 but with a strong possibility of a higher age, the clinico-physical evidence was inaccurate and tenuous and would not have held water under examination in a court of law. The psychological effect of this expert report however was sufficient to force a capitulation which eventually led to much needed compensation for an individual from a lower socio-economic group whose future was compromised by the loss of a leg.

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The Dentist and Patient — A Legal Review

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Abstract

The legal and ethical relationships between the dentist and his patient are discussed with particular reference to South African law and ethical norms. Negligence and malpractice are defined and common causes for claims of negligence and malpractice are sited. These include failure of diagnosis, improper diagnosis, failure to refer, failure to inform, removal of the wrong tooth, nerve damage, provision of dentures and dental fraud. The importance of adequate malpractice insurance cover is discussed.

Keywords: Dentist, patient, law.

Introduction

The legal relationship between the dentist and his patient is embodied within two constraints;

(a) The norms of treatment and ethical requirements which are pertinent for his region or country and
(b) the law of the land.

(a) **Ethics and Norms of Treatment**
In South Africa the ethical norms are set by a statutory body, the South African Medical and Dental Council (SAMDC). Ethical rules are constantly changing and are sometimes difficult to interpret. Changes and judgements are usually made known to practitioners by their professional association as well as through the media. The norms of treatment are also partly controlled by the SAMDC when it inspects the training courses at the Universities. The latter also set their own standards in accordance with acceptable western world practice.

(b) **The Law**
Here, common law and its interpretation in the supreme court sets legal precedent and thus establishes the legal constraints of practice and patient treatment.

Negligence and Malpractice

When the dentist does not fulfil his obligations to the patient, he is considered to be negligent by doing something that he should not have

done (commission) or by not doing something that he should have done (omission). The essentials for a **negligence** claim are that the patient must demonstrate that the practitioner did not use reasonable care in omission or commission and that consequently the patient sustained injury.

Malpractice applies to a broader range of offences in which failure to exercise knowledge, skill or care to the detriment of the patient applies. This would include fraud, advertising or any other matter which may not be involved directly in the treatment of the patient.

In a claim of action it has to be established that:

1) A patient-dentist relationship existed at the time of the alleged breach of obligation,
2) the dentist breached this duty, either by commission or omission, to the patient's detriment and that
3) a relationship exists between the nature of the injury and the negligent act.

Examples of the basis for malpractice and negligence claims and a short explanation of how they are likely to arise or, more importantly, may be avoided.

1. **Failure of diagnosis**

To arrive at a correct diagnosis the following steps should be followed:-

(a) An adequate medical and general history.
(b) A history of the main complaint and related factors.
(c) A thorough examination using as many diagnostic aids as is reasonably necessary, such as radiographs, laboratory investigations and study models.

Should a claim arise, under South African law, a reasonable degree of professional skill and care would have been expected. The standard of skill and care to be attained is that of the average competent dentist who is exercising the average degree of professional skill. A higher degree of skill is expected from a specialist.

2. **Improper diagnosis**

Even if the preceding steps are taken, an improper diagnosis may still be arrived at. This would relate more to a lack of knowledge of current trends in diagnosis and therapy. This may be avoided by the dental practitioner taking every advantage of continuing education courses. It is also wise to keep abreast of the current literature and the most recent advances in treatment as well as making his job as a health professional a more stimulating and fulfilling one.

If a claim were to arise with regard to improper diagnosis, the only way of refuting this would be to provide a written record of proper examination and diagnosis. These records should be taken at the time of examination in the presence of the patient and should be retained together with any special investigation for at least ten years.[1] In South Africa there is no legal requirement to keep written records but it would

be most inadvisable not to have these as failure to produce records, in the event of a claim, would seriously hamper the defence of the claim.

3. **Failure to refer**

Due to the vast increase in professional knowledge, specialisation has become essential and it would be considered negligent for a dentist to attempt services for a patient that are beyond his limits of skill, training and experience. This may well become an ever-increasing basis for claims of negligence in the future with the success of caries prevention campaigns eroding the traditional scope of work of the general practitioner. This may also be the basis for claims between rival specialities, either protecting or trying to extend their fields of practice.

4. **Failure to inform**

The principle of **informed** consent is a factor often neglected at the practitioner's peril. Legally the doctor's right to treat or operate on a patient is based entirely on the patient's consent. The four golden rules of consent are:-

1) Always obtain consent from the person legally entitled to give it. In the case of a child it is **always** wise to get the mother or father's **written** consent. In an emergency the consent can be given by those nominated by the parents or by the state to do so. It is important to remember that an unaccompanied person between the ages of 18 and 21 may sign consent in the absence of parents.
2) A broad explanation of **why** the treatment is necessary and **what** the specific treatment will be must be given together with the expected result of treatment. This must include the more common hazards of the treatment but need not necessarily include rare and seldom experienced complications.
3) A clear and
4) comprehensive consent. Essentially there must be no dispute as to what the patient consents to. It is an unsatisfactory fact that many hospitals and clinics have a broad-based consent which is signed by the parents but which would be ruled invalid in a court of law. Failure to get adequate consent could result in charges of assault or crimen injurea.

If the patient places **unreasonable limitations** on the scope or nature of treatment and if the dentist feels that this is prejudicial to the successful outcome of the treatment, there is legally only one safe course and that is to **refuse to treat the case.** Apart from emergency situations and where treatment has already begun, there is no legal obligation on the part of the dentist to treat a patient.

In no circumstances should the result of any treatment be guaranteed as this would render the dentist open to legal action should the treatment fail. Strauss[1] submits that when a patient consults a doctor who undertakes to treat him, the doctor assumes no greater duty than to treat the patient with due care and skill unless a doctor has especially guaranteed that a patient will be healed by his treatment — something which a prudent practitioner would generally not do.

The dentist whose practice involves the treatment of a high percentage of under-age patients should be very careful to get an informed, written consent prior to treatment. It is also important for the dentist to check the consent for treatment prior to doing any case under general anaesthetic as this consent may have been obtained by a third party at the hospital or clinic where the dentist is working and may not necessarily reflect accurately the treatment to be carried out.

5. **Removal of the wrong tooth**

This disastrous eventuality can be the result of poor communication between the dentist and specialist or due to incorrect diagnosis. More likely, it may simply be a mistake on the part of the operator. This negligence is virtually indefensible and a claim will inevitably have to be settled to the dentist's disadvantage. It is advisable in all cases to point the problem out to the patient immediately it occurs and not to compound the mistake by trying to cover up the blunder.

6. **Nerve damage — motor or sensory**

Virtually any surgical procedure carried out by the dental practitioner, and this would include endodontics and injection therapy, could result in nerve damage. It is noteworthy in the past that claims in this regard are often associated with poor pre-operative counselling of the patient and lack of adequate radiographs. It is often wise to obtain the opinion of a qualified neurologist or neurosurgeon if damage of this nature should occur, especially if there is any uncertainty as to the prognosis of the injury.

7. **Problems with the provision of dentures**

Dentures sometimes do not come up to the patient's expectations because they are technically inadequate or because of poor patient counselling as to the limitations of denture-wearing. In this regard the general dental practitioner in South Africa is at a disadvantage as a peculiarity exists in the law which considers the provision of dentures as a sale of goods. In the case of Tulloch vs Marsh[1], the judgement was that no professional fee can be claimed if a dissatisfied patient returns the dentures. This decision is, however, likely to be overthrown if ever tested in a court again, but until then the judgement stands.

8. **Dental fraud**

There are an increasing number of cases of this unfortunate crime occurring which can probably be ascribed to such causes as difficult economic circumstances and the over-production of dentists. It is encumbant on the dentist always to ensure that, firstly, the treatment rendered was not in itself excessive or unnecessary and, secondly, that the statement or account accurately reflects the treatment carried out. All too often the misguided dentist is found to have been trying to help the patient by changing treatment dates or charging treatment to other members of the family. If a charge of fraud is laid, no cognizance of the dentist's helpful motives will be taken. With the advent of computerisa-

tion of dental practitioners' accounts by the medical aid societies, a profile of a particular dentist's practice can be produced and if this differs significantly from the norm then this may trigger an investigation and subsequent action.

Malpractice Insurance

The incidence of malpractice litigation in South Africa is increasing although the vast majority of these cases are either settled out of court, to the dentist's disadvantage, or abandoned. We live in an age of increased public awareness of dentistry as well as a legal system eager to represent the injured patient. South African law fortunately does not operate on the contingency system whereby the lawyer receives a share of the damages if he wins the case. This makes litigation extremely expensive for the patient and certainly deters all but the most persistent litigant. Costs may also be awarded against an unsuccessful litigant under South African law. It would be extremely foolhardy for any dental practitioner to practice without adequate malpractice insurance cover as the dentist could be financially ruined in meeting legal costs, even if he/she wins the case. Dentists in full-time employment should also take out this insurance which is available through the professional society at very reasonable cost.

Conclusion

In this paper I have tried to summarise the main legal and ethical constraints governing the dentist-patient relationship in South Africa. It is particularly important for a newly graduated dentist to be thoroughly acquainted with these regulations as a claim for malpractice or negligence can be extremely distressing and, if the dentist is not adequately insured, very expensive. It cannot be over-emphasized that adequate and satisfactory communication between a dentist and his patient is probably the single most important factor in avoiding problems of this nature.

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