

Mirror image supplemental primary incisor teeth in twins: case report and review

Douglas Beere, BDS J. Anthony Hargreaves, LDS, MChD, AM, MRCD(C)
Geoffrey H. Sperber, BSc, BDS, MS, PhD, For Assoc RSSAF
Peter Cleaton-Jones, MB, ChB, BDS, PhD

Case Report

During a survey in a rural area of northern Namibia (South West Africa) in 1988, 4-year-old twin boys were seen (Fig 1). One child had a supplemental primary maxillary lateral incisor on the right side; the other had a supplemental primary maxillary incisor on the left side (Figs 2 and 3, see next page).

Root length occlusal and panoramic radiographs were taken which showed that each child had a supplemental permanent incisor that replaced the primary supplemental incisor (Fig 4, see next page). The primary supplemental teeth were mirror images, and subsequent caries patterns which occurred also involved the maxillary teeth in a mirror-image fashion (Figs 2 and 3). The existence of transposed viscera could not be investigated.

It was not possible to obtain birth records for this rural village community of Herero people, or to obtain blood samples to confirm the monozygotic relationship. Traditionally, in Southern African tribes, twins are not welcomed, and the second twin commonly is not allowed to survive. It is unusual to find acceptance of these children within the community. Because of this tradition, it was not possible to seek out other family members who were twins and could have had similar dental conditions.

Literature Review

Anomalies of the dentition may involve either number and/or morphology, and may incur either the primary and/or permanent teeth. Difficulties in distinguishing number and morphology occur in the gemination and/or fusion of teeth, and in determining whether extra teeth are supplemental or supernumerary (Killian and Croll 1990). Gemination may be defined as the incomplete division of a single tooth bud during development, resulting in increased tooth material, but



Fig 1. Photograph of the twin boys with examining dentist (DB), showing their facial and physical features.

not number, of teeth. Fusion is the union of initially disparate tooth buds, resulting in a reduced number of teeth (Surmont et al. 1988; Camm and Wood 1989). The contrary occurrence of hyperdontia may produce nor-

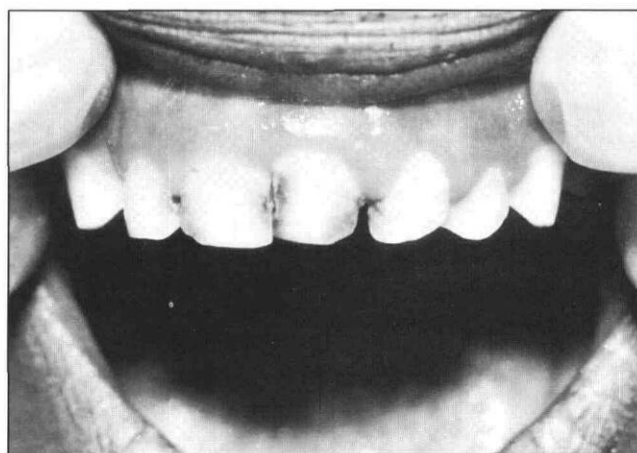
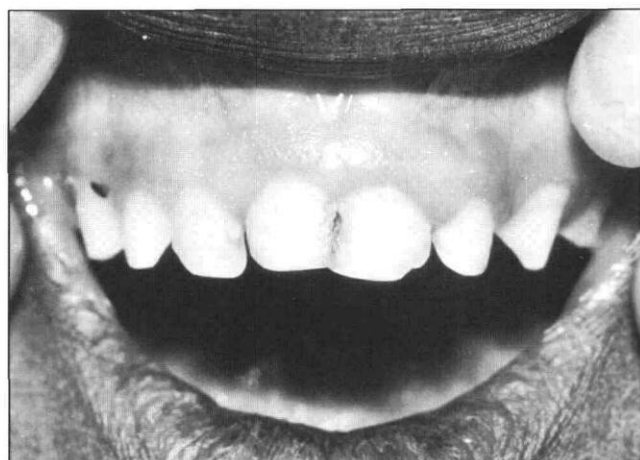


Fig 2 and 3. Clinical photographs of the twins: twin A (Fig 2) has a supplemental right primary maxillary incisor and twin B (Fig 3) has a supplemental left primary maxillary incisor.

mally shaped additional members — supplemental teeth — or defectively developed supernumerary teeth. Hyperdontia occurs more commonly in the permanent dentition and more frequently in incisors than it does in canine or post-canine teeth (Stewart and Prescott 1976). Primosch (1981) reported that the majority of primary extra teeth are supplemental, mostly lateral incisors. Moreover, supernumerary teeth in both primary and permanent dentitions in the same individual occur in approximately one third of cases, again involving lateral, rather than central, incisors. Nonsyndromic multiple supernumerary teeth are uncommon, and tend to occur in the mandible (Yusof 1990).

Ravn (1971) and others have examined aplasia, supernumerary teeth, and fused teeth in the primary dentition. A few cases of mirror image dentitions in monozygotic twins have been reported in the literature, but no case was found showing mirror image supplemental primary teeth. Nik-Hussein and Salcedo (1987) reported a case of hypodontia in Filipino twin boys with "double" fused teeth in the anterior maxilla, but on opposite sides. Carton and Rees (1987) described mirror image dental anomalies in twin boys in Britain. One had a conical supernumerary tooth unerupted on the right of the midline in the maxilla; the other had an unerupted supernumerary tooth on the left of the midline in the maxilla. Both children required surgical removal of these teeth, which were thought to be mirror images from their position before surgery. Schneider (1985) described geminated incisors in twin boys in Louisiana. One had a geminated right central and lateral incisor, and the other had a geminated left central and lateral incisor. A report by Mensing (1983) described 2-year-old Caucasian twin boys, one with incomplete fusion of upper right central and lateral primary incisors, and the other with complete fusion of upper left central and lateral primary incisors. West (1985) reported a case of

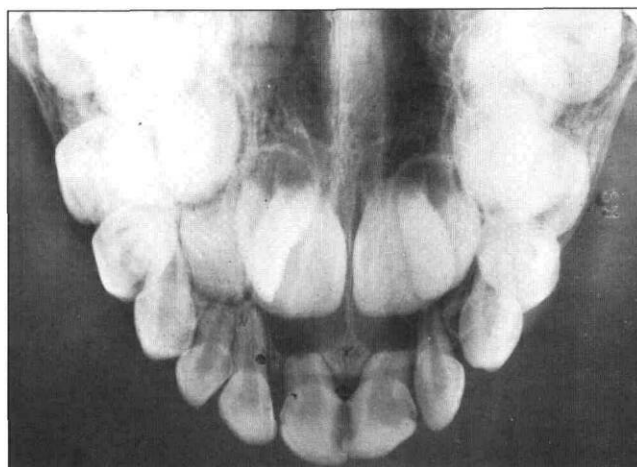


Fig 4. Radiograph of twin A showing the supplemental primary right maxillary incisor with an unerupted successional supplemental permanent right maxillary incisor.

twin girls in Australia with missing maxillary lateral incisors, one with the incisor missing on the left side, and the other with the incisor missing on the right.

From these case reports, it is clear that mirror imaging of dentitions in monozygotic twins can occur. Recent findings from a large retrospective twin study in Belgium suggest that because of current clinical practice, the monozygotic twinning rate is significantly higher (1.2%) after ovulation induction than it is after spontaneous ovulation (0.45%), resulting in an increased twin birth rate (Derom et al. 1987). Mirror image translocations of asymmetrical traits are said to occur in almost half of human monozygotic twins. Identical twinning is a result of very early subdivision of a common embryonic inner cell mass at the time of proamniotic cavitation, which provides opportunities for proximate interactions to occur before separate axes

are established. This suggests a hypothesis to explain mirror image translocations and asymmetrical traits. Mirror image twinning has been examined to see if it is a reflection of a genetically mediated embryological event (Carter-Saltzman 1979). Concordance rates in monozygotic twins will only be high if the heritability is very high (Smith 1970). Consequently, low concordance rates in these twins do not necessarily prove that genetic factors are unimportant in predisposition to a disease.

Adjacent proamniotic cavities in a common placenta may reciprocally modify each other's incipient axial asymmetries, so that adjacent same-sidedness is required along the anteroposterior axes (i.e., adjacent right-left asymmetries would be precluded). The hypothesis requires that duplication of embryos becomes established before axial determination, which occurs upon the appearance of the primitive streak and notochord (O'Rahilly 1970).

Runner (1984), in experimental work with monozygotic twins in mice, gives evidence for twinning initiated in the late blastocyst, which can account for mirror image asymmetries. Mirror imaging can occur in any structure, normal or anomalous, with mirror-image facial clefting and cardiovascular anomalies in twins reported. Mirror polydactyly within a single individual (Viljoen and Kidson 1990) allows for conjecture of its pathogenesis, whereby blockage of predetermined cells leads to the establishment of a second morphogenetic gradient. A new organ can result from this second initiation (Wolpert 1971).

Discussion

This new case report on African twin boys gives the first recorded case of supplemental mirror imaging in anterior primary teeth. The monozygosity of the twins was impossible to determine because of limited access to them, but is indicated strongly by their general physical likeness — similarity of appearance of hair, eyes, skin, ears, teeth, and hands (Newman et al. 1937).

Dental caries can occur symmetrically and occlusal development can be modified with different developmental results by environmental factors such as diet, personal oral hygiene, and dental treatment in the dentitions of twins (Hargreaves 1962).

This case report adds further information on the genetic determination of teeth and embryonic interactions resulting in mirror imaging occurring in the den-

titions of monozygotic twins. The similarity of environmental factors causing a characteristic pattern of dental caries in monozygotic twins also is shown.

Dr. Beere is a graduate student at the University of the Witwatersrand. Dr. Hargreaves is professor and director of Graduate Studies and Research in the Faculty of Dentistry, University of Alberta. Dr. Sperber is professor of Anatomy in the Department of Oral Biology in the Faculty of Dentistry, University of Alberta, and Dr. Cleaton-Jones is professor and director of the Dental Research Institute, University of the Witwatersrand. Reprint requests should be sent to: Dr. J. Anthony Hargreaves, Faculty of Dentistry, University of Alberta, Edmonton, Alberta T6G 2N8, Canada.

Camm JH, Wood AJ: Gemination, fusion and supernumerary tooth in the primary dentition: report of case. *ASDC J Dent Child* 56:60-61, 1989.

Carter-Saltzman L: Mirror twinning: reflection of a genetically mediated event? *Behav Genet* 9: 442-43, 1979.

Carton A, Rees RT: Mirror image dental anomalies in identical twins. *Br Dent J* 162:193-94, 1987.

Derom C, Vlietinck R, Derom R, Van Den Berghe H, Thiery M: Increased monozygotic twinning rate after ovulation induction. *Lancet* 1:1236-38, 1987.

Hargreaves JA: Dental arch development following deciduous tooth extraction in identical twins. *Odontol Revy* 13:327-30, 1962.

Killian CM, Croll TP: Dental twinning anomalies: the nomenclature enigma. *Quintessence Int* 21:571-76, 1990.

Mensing CA: Mirror-image twins. *Northwest Dent* 62: (6), 41-42, 1983.

Newman HH, Freeman FN, Holzinger KJ: *Twins: A Study of Heredity and Environment*. Chicago: University of Chicago Press, pp. 1-369, 1937.

Nik-Hussein NN, Salcedo AH: Double teeth and hypodontia in identical twins. *ASDC J Dent Child* 54:179-81, 1987.

O'Rahilly R: The manifestation of the axes of the human embryo. *Z Anat Entwicklungsgesch* 132:50-57, 1970.

Primosch RE: Anterior supernumerary teeth — assessment and surgical intervention in children. *Pediatr Dent* 3:204-15, 1981.

Ravn JJ: Aplasia, supernumerary teeth and fused teeth in the primary dentition: An epidemiologic study. *Scand J Dent Res* 79:1-6, 1971.

Runner MN: New evidence for monozygotic twins in the mouse: twinning initiated in the late blastocyst can account for mirror image asymmetries. *Anat Rec* 209:399-406, 1984.

Schneider PE: Mirror-image twins with geminated incisors. Report of a case. *Quintessence Int* 16:429-31, 1985.

Smith C: Heritability of liability and concordance in monozygous twins. *Ann Hum Genet* 34:85-91, 1970.

Stewart RE, Prescott GH eds: *Oral Facial Genetics*. St. Louis: CV Mosby Co, 1976, pp 138-142.

Surmont PA, Martens LC, De Craene LG: A complete fusion in the primary human dentition: a histological approach. *ASDCJ Dent Child* 55:362-67, 1988.

Viljoen DL, Kidson SH: Mirror polydactyly: pathogenesis based on a morphogen gradient theory. *Am J Med Genet* 35:229-35, 1990.

West VC: Mirror image twins. *Aust Orthod J* 9:243, 1985.

Wolpert L: Positional information and pattern formation. *Curr Top Dev Biol* 6:183-224, 1971.

Yusuf WZ: Non-syndrome multiple supernumerary teeth: literature review. *J Can Dent Assoc* 56: 147-49, 1990.