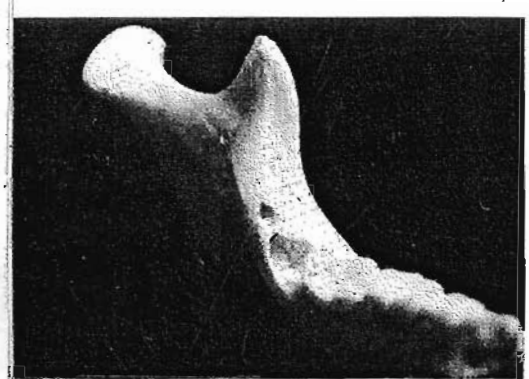
THIRD MOLAR ENUCLEATION:

DIAGNOSIS AND TECHNIQUE

Robert M. Ricketts, DDS, MS
Patrick Turley, DDS
Spiro Chaconas, DDS, MS
Robert J. Schulhof, BA, MA

Some dentists may be disciplined to call for extraction of all third molars on a prophylactic basis, while others recommend keeping them for function or for "insurance." The third molar may be employed for bridge abutment or serve for maintaining facial height and posterior support of the jaw and protection to the temporomandibular joint. Most dentists agree that the lower third molar can cause problems. These are listed as pain, infection, eruptive disturbances, crowding of lower incisors, weakening of mandibular skeletal structure at the angle, and possible (but rare) epithelial remnant differentiation to squamous cell carcinoma, if they remain impacted.



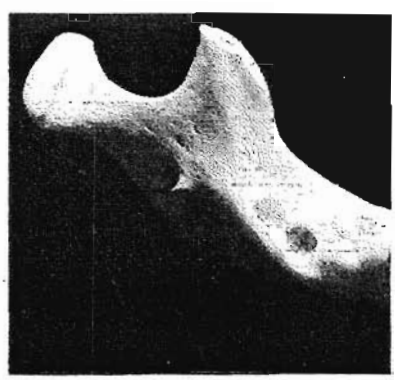
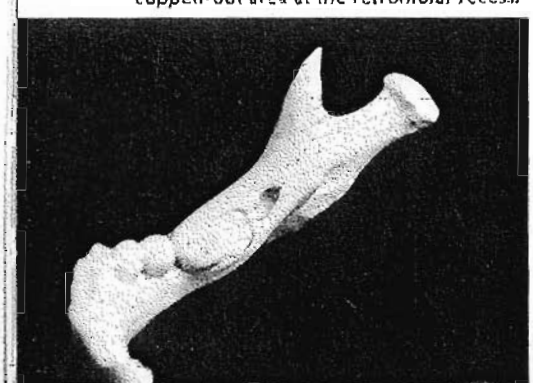


Fig. 1-A, B — Molar tooth crypt which forms on the surface of the bone and appears as a cupped-out area at the retromolar recess.



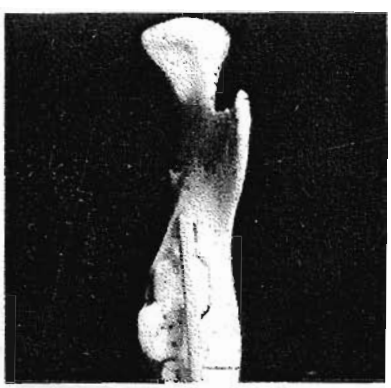


Fig. 1-C, D — Note the inferior margin of the temporal crest on the mandible.

Thus, the lower third molar may be a nuisance to patient and dentist alike. Many young adults between the ages of 18 and 22 experience problems with their wisdom teeth. Approximately 50% of the population will undergo removal of some, or all, of the third molars before the age of 30.

The third molar may be a particular problem to the orthodontist attempting a malocclusion correction at any age. However, in the act of making space for lower incisors or anchorage preparation, the distal movement of the first molars may be required. Limited space for the second molar may be produced with severe impaction of the third molar. It has been shown that patients congenitally missing the third molar have fewer problems of crowding or impacting of the lower second molars during treatment. It has been shown that early removal of the third molar relieves the congestion at the end of the lower arch and enhances development of the lower dentition.

It would appear, if it were possible

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to make a prognosis of ultimate space available, many of the aforementioned occlusal developmental problems could be prevented. If the third molar could be aborted in its budding stages of development, in those patients where it is indicated, it would simplify problems in development of occlusion. C. B. Henry described a technique for this procedure in 1934, and has practiced this theory for 40 years.

The enucleation of the lower third molar at the bud stage, or beginning calcification stage, is desirable. The removal of the bud at the age of 7 to 10 years is surprisingly simple and relatively atraumatic. This contrasts to the difficulty of extraction of deep impactions in adults, the risk of dry sockets, and often difficulty in development of the second molar. The desirability of early removal of potentially impacted third molars can be realized by examining some of the developmental characteristics of the molar teeth. Ricketts observed that the molar tooth crypt is seen to form on the surface of the bone and appears in the dried mandible as a cupped-out area, or a small channel invagination, at the retromolar recess. (Fig. 1-A, B)

During development it apparently erodes into the bone and forms a spherical-shaped crypt, forming a large window on the lingual plate, and making for easy access from the medial side of the ramus.

Consideration of Surgical Anatomy and Technique

To state the proposition, it may be appropriate to repeat the conclusion published by Henry in 1936, and again in 1969:

"Probable impaction of the mandibular third molar may be diagnosed from lateral X-ray films in children between the ages of 9 and 11 years, and sometimes earlier, depending upon the development of the individual. In those subjects in whom insufficient room for full eruption of the third molar becomes evident, it is wiser to enucleate the follicles of this tooth immediately, than to leave the case until the tooth has become fully and grossly impacted.

"The operation is quickly and easily performed. Although the tidying up, if scrupulously done, may take several minutes, the actual removal of the tooth germ should not exceed a minute, and the procedure contrasts most favorably with the difficulty of extracting the same tooth when the crown is formed, and still more when it is deeply buried or horizontally placed with, perhaps, divergent curving roots. The trauma is less, and the patient benefits by losing the tooth at the time when the bone is soft and healing is rapid.

"For this operation, at 7 to 9 years, the incision is made in the anatomical crease — posterior to the site of the second molar. An opening here usually leads immediately into the small aperture in the roof of the crypt which, when the tissues have been retracted, is revealed by a bluish bulging of the tooth-sac. The tooth-sac is displaced by a flat spoon, shaped like a large excavator. The neck which joins the tooth-sac to the remains of the gubernalculm is severed."

Between 1929 and 1956, Henry performed 3,000 such operations successfully, with no adverse reports in the 20 postoperative years. In 1956, Henry became Senior Surgeon of the Royal Dental Hospital in London, Eng.

Ricketts Technique

At the suggestion of John Flocken, UCLA, Dept. of Postgraduate Education, Ricketts worked out an approach in 1970, with the use of electrosurgery, without previous knowledge of Henry's work. It was determined that the third molar crypt lay in a direct line with the buccal cusps of the lower occlusion. (Fig. 1, C, D)

For the surgical procedure, an ordinary mandibular carbocaine block, with local anesthetic, proved to be adequate. In addition, due to the buccinator involvement, a long buccal branch block was employed.

Fig. 2 — Palpating and locating anatomy prior to incision. Note slight fold of tissue or crease at the buccal margin of gum fold.

The Dento-Surg unit is employed with the short straight needle. The incision was made near the aforementioned fold, and the buccinator tissue can be lifted to avoid sectioning muscle fiber. (Fig. 2) The tooth crypt is forward of the pterygomandibular raphe in the recess just posterior to, and below, the internal oblique ridge. An incision of about 8 to 10 mm in length, starting just medial to the raphe and running forward in the mucobuccal fold, often present, to about the posterior margin of the developing second molar, has proven to be generally acceptable. (Fig. 3) The tissue is then elevated by an elevator (Tarno #22 Seldin) to expose the follicle or crypt. The incision site and crypt are well above the lingual nerve and the second molar crown.

A series of spoon curettes were employed to excavate the crypt and enlarge the opening (Tarno #85 Lucas) (Tarno #4MD) (Tarno #43 Seldin). (Fig. 4) The gel-like mass of the crypt will come out

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Fig. 3 — Incision made to the buccal of the crease for direct access to the follicle, usually made if calcification of crown is forming.

Fig. 5 — The remains of the calcified cusps and epithelial and connective tissue containing Hertwig's sheath.

Fig. 8 — Scraping the walls of the crypt for remaining epithelial lining.

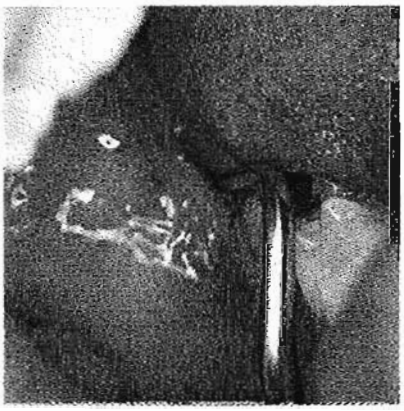

Fig. 4 — Opening of the crypt, which is curetted.

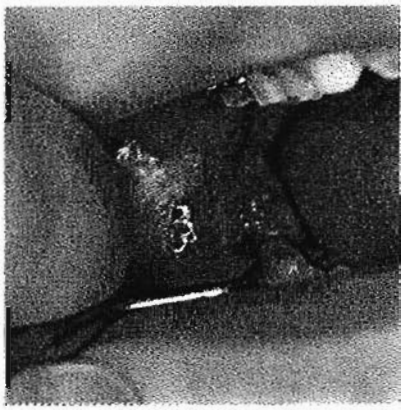

Fig. 7 — The dental papilla.

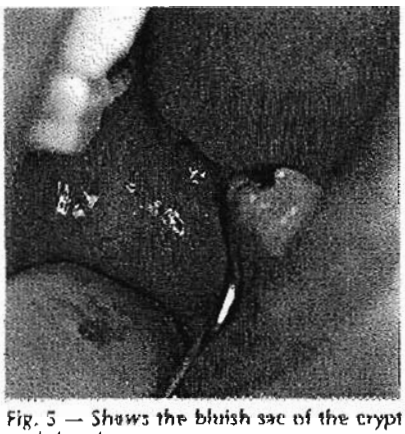

Fig. 5 — Shows the bluish sac of the crypt and sheath.

easily and will separate from the calcifying cap or cusps if they are formed (Fig. 7). Naturally, as the crypt is entered, some hemorrhage can be expected, as is seen in all tooth crypts. This rich blood supply is necessary for the developing tooth, but will soon terminate after enucleation has been completed. The window in the bone is usually 6 to 8 mm in width.

If the crown has partially formed, the crown can be broken up, or a surgical bone bur can be employed to widen the window to the crypt, from front to back, in order to remove the cap, which can be done handily with a mesquito hemostat once access is gained. Careful scraping of the crypt to remove remnants of the membrane is then performed. (Fig. 8) Due to fear of leaving epithelial remnants, some electrical coagulation was used originally in the wall of the crypt. However, this delayed healing and was abandoned. As Henry reported, no remnant proliferation was seen in his whole experience of 40 years.

If the incision is small, no suturing is employed. The patient is advised that some swelling and posttreatment pain might be experienced, and aspirin or Darvon can be used. No dry sockets nor posttreatment hemorrhaging have been experienced and healing has been uneventful in nearly 100 instances so far treated with this method by Ricketts or surgeons reporting on referred cases.

Diagnosis and Prognosis

Three major controversies have been expressed relative to third molar enucleations. First is the possibility of the future loss of first or second molars due to caries, and the need for the third molar for bridge abutment. The second relates to the uncertainty of normal eruption to full occlusion, and the needless loss of molar teeth to the individual who can use them to good advantage. Finally, a concern over complications in surgery in the child has been noted. Studies in regard to these

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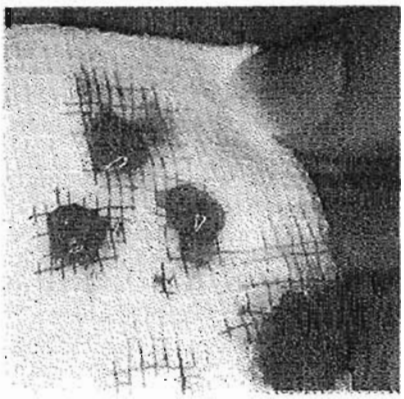

Fig. 9 — Contents including the sheath, the cusps, and the papilla.

problems were conducted, and are discussed herein.

Research

Longitudinal growth studies by both Ricketts and Moss, on the mandible and the development of the lower arch, led to the conclusion that the mandible grows on an arc, and that the molars move upward and forward to produce space for the third molar. (Fig. 10) The studies employed a measured point at the centroid of the ramus call Xi point. (Fig. 11)

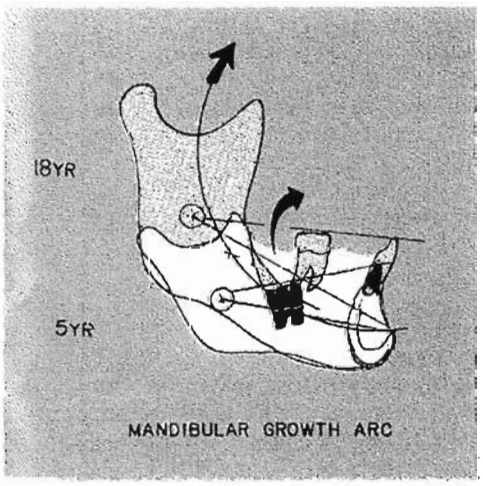

Fig. 10 — Archal growth of the mandible. Ricketts method of predicting mandibular development an ultimate space at maturity for the third molars indicates that space appears to be created by upward and forward growth of the first and second molars with only minor remodelling of the anterior border of the ramus.

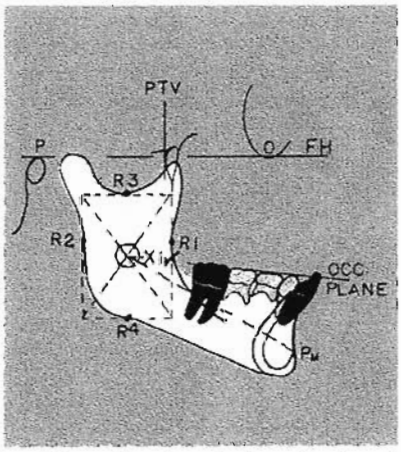

Fig. 11 — Xi point. Tracing of a lateral headfilm with location of Xi point initiation of third molar in line with the occlusal plane at the site of check point.

A study was conducted by D. L. Anderson. It showed that the probability of loss of one or more second molars is only approximately 15%, and of these, one-third lost the third molars prior to loss of the first and second, due to diagnosed impactions. Thus, it is possible to conclude that in an upper socio-economic group, the third molar would be needed and available to replace a first or second molar in only 10% of the population.

After studying 200 skulls with the complete dentition, Ricketts determined the relationship of erupted third molars to anatomy of the ramus. (Fig. 12) He further suggested using cephalometric head films for diagnosing the probability of impaction of the third molars, due to its use for forecasting in the child patient. Ricketts went on to hypothesize that the percentage of width of the lower third molar, anterior to the external oblique ridge of the mandible, viewed in the lateral headplate, would yield a percentage probability of third molar eruption. By means of the principle of arcial growth of the mandible, it was possible to predict the molar probability at maturity from deciduous or mixed dentition age levels. The reliability of this method was verified on approximately 100 orthodontic cases, and was the method employed by Ricketts in diagnosing the need for early third molar enucleation.

Another study was conducted by Patrick Turley, UCLA School of Dentistry, which reconfirmed the earlier work of Ricketts. Turley's study was based on 74 orthodontically treated cases from the Ricketts-Bench files. They were divided into three groups: Those in which molars were impacted, those with third molars in functional occlusion, and those with third molars erupted but not in occlusion.

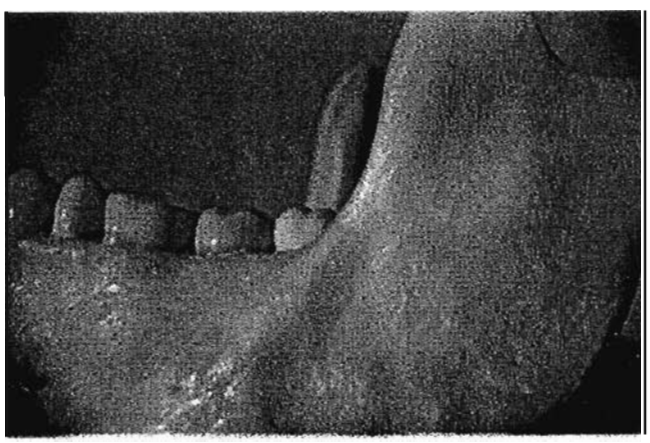

Fig. 12 — Photograph of mandible across the anterior border showing erupted third molar in excellent occlusion with distal margin behind external ridge.

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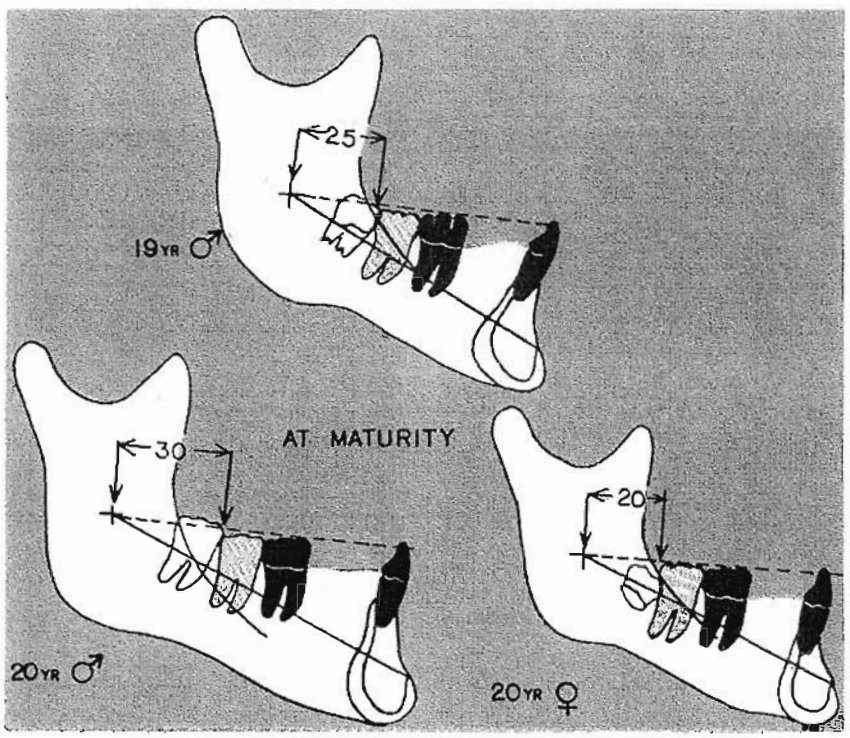

Fig. 13 — Turley's method of measuring the third molar space — the distance from XI point to the distal of the second molar. Borderline in male, age 19, at 25mm; adequate spaces in male, age 20, at 30mm. Limited space and molar removed in female, age 20.

Turley's conclusions were:

1. The probability of the eruption of the lower third molar was a function of the space available, and
2. The space was conveniently represented on a lateral cephalometric head film by the distance from the centroid of the ramus (Xi point) (Fig. 13) to the distal border of the second molar.

Because Xi point is a measured point from the anterior border of the mandible, the findings of the Ricketts and Turley studies coincided well.

Using normal probability theory and Bayes Theorem, a curve was derived to represent the probability of third molar impaction as a function of the distance from XI point to the distal border of the second molar. (Fig. 13).

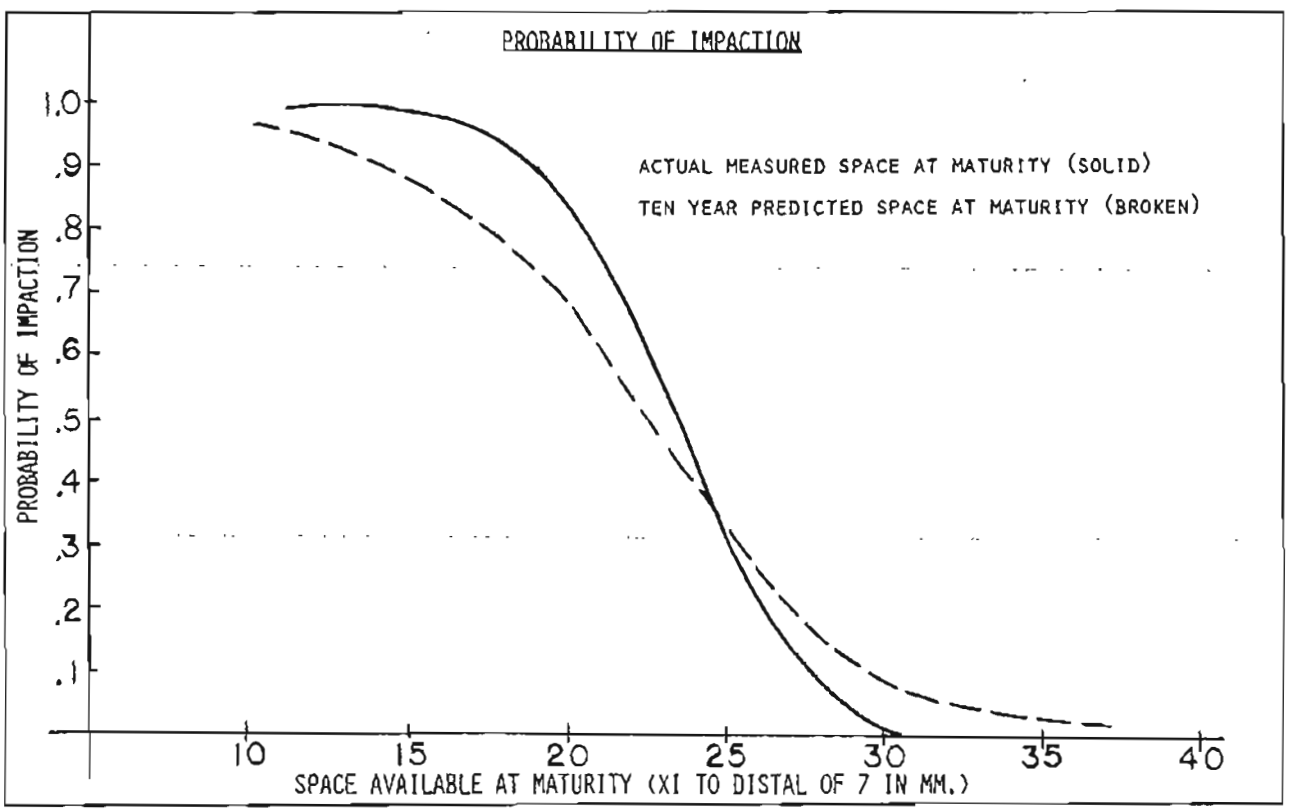

Fig. 14 — Probability curve. The curve for probability of impaction as a function of predicted space available.

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Diagnosis and Prognosis

The usual general dentist may be unfamiliar with cephalometrics and detailed identification of landmarks on the lateral headplate. It was suggested, therefore, that practical forecasts be made commercially available. The aid of the computer for probability and prognosis of the third molar was thought to be a great advantage. The idea was for it to be used to determine probable ultimate space available, and to be used as a consideration by the dentist charged with the diagnosis.

For further verification, a sample of cases of 10-year untreated records from the University of Michigan was used for the study. Statistically, the result was a root-mean-squared error of 2.86mm in predicting available space for the third molars. Because the average space available was 24mm, accuracy for the majority of patients was 24-2.86/24 = 88% for a 10 year prediction. This figure is inclusive of all tracing and other methodological errors. It was interpreted to indicate a prediction of approximately 90% accuracy at the age of 8.

Additional results of the studies were probability curves for the three aforementioned eruptive patterns of the third molars. The curve for probability of impaction as a function of predicted space available is presented in Figure 14.

Summary

There is no controversy regarding the problems of the lower third molar. As dentistry focuses more and more on occlusion, the development of the dental arch has become of greater interest, and the role of the lower third molar has been reinvestigated as new research sheds light on its conceivable effects. Prevention of problems is possible by the enucleation, or abortion, of the molar bud at the mixed-dentition-age level.

The procedure consists of an incision at the retromolar folds in the line of the buccal cusps. The crypt at this stage is on a level with the occlusal plane. The crypt is located with a small curette, and the papilla and sheath are removed.

Diagnosis is made from lateral head films with projected growth of the mandible and forecasts of the occlusal plane. The mandible is now theorized to grow on an arc, and space can be considered from its predicted ramal border, or from the centroid of the ramus (Xi point).

Several studies were conducted for verification, and were cited for the compilation of statistical probabilities of impaction, eruption, potential and full occlusion possibilities.

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Reprint requests to:
Robert M. Ricketts, DDS
984 Monument St.
Pacific Palisades, CA 90272

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