PHILIPPINE JOURNAL OF OTOLARYNGOLOGY-HEAD AND NECK SURGERY VOL. 30 NO. 1 JANUARY – JUNE 2015

3D Stereolithographic Modeling of an Inverted Papilloma

Ian C. Bickle, MB, BCh, BAO, FRCR

Department of Radiology
RIPAS Hospital
Bandar Seri Begawan
Brunei

This middle-aged woman presented for the first time to ENT clinic with a complaint of nasal stuffiness.

Computed Tomography (CT) of the paranasal sinuses was performed following clinical review that revealed a left intranasal mass.

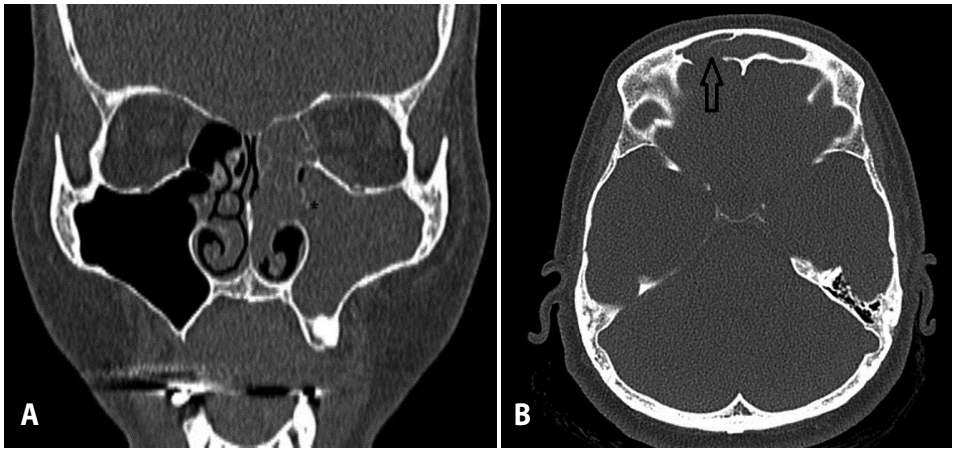

Figure 1A. Coronal CT Paranasal Sinuses (bone widows) showing complete opacification of the left maxillary sinus and left ethmoidal air cells with widening (*) of the osteomeatal complex **B.** Axial CT Paranasal Sinuses (Bone windows) showing opacification of both frontal sinuses with destruction of the posterior wall of the right frontal sinus (arrow).

Due to a radiological suspicion of an inverted papilloma, Magnetic Resonance Imaging (MRI) of the paranasal sinuses was performed.

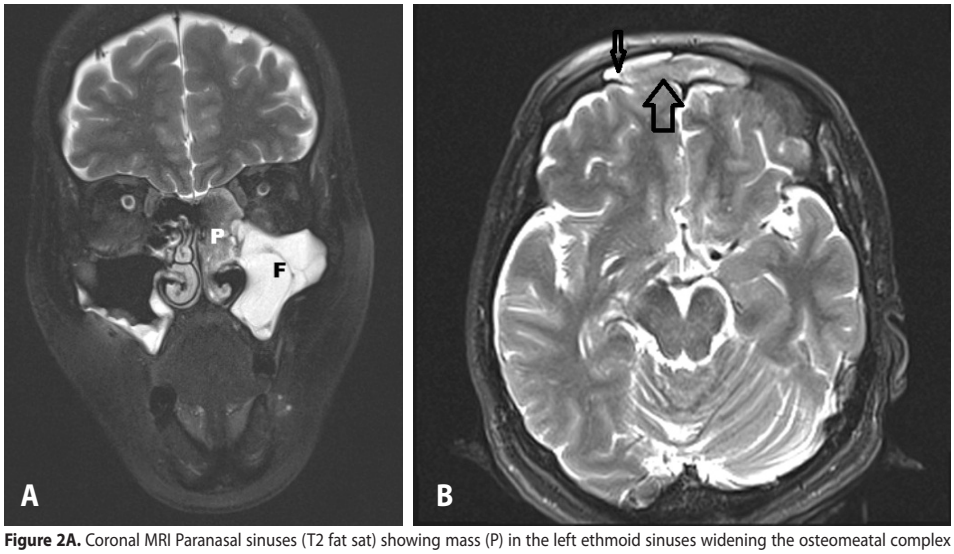

Figure 2A. Coronal MRI Paranasal sinuses (T2 fat sat) showing mass (P) in the left ethmoid sinuses widening the osteomeatal complex with post-obstructive fluid in the maxillary sinus (F) **B** Axial MRI Paranasal sinuses (T2 fat sat) showing mass (wide arrow) occupying most of the frontal sinuses with only a slither of sinusoidal fluid (thin arrow).

Correspondence: Dr. Ian C Bickle
Consultant Radiologist
Department of Radiology
RIPAS Hospital
Bandar Seri Begawan BA1710
Brunei Darussalam
Phone: + 00 673 8 612182
Fax: + 00 673 224 2690
Email: firbeckkona@gmail.com
Reprints will not be available from the author.

The author declared that this represents original material that is not being considered for publication or has not been published or accepted for publication elsewhere, in full or in part, in print or electronic media; that the manuscript has been read and approved by the author, that the requirements for authorship have been met by the author, and that the author believes that the manuscript represents honest work.

Disclosures: The author signed disclosures that there are no financial or other (including personal) relationships, intellectual passion, political or religious beliefs, and institutional affiliations that might lead to a conflict of interest.

Philipp J Otolaryngol Head Neck Surg 2015; 30 (1): 67-68

This, combined with endoscopic biopsy confirmed an inverted papilloma.

Following referral to oral maxillofacial surgery (OMF), 3D modelling was performed using the original CT data to aid surgical planning.

Figure 3. 3D Stereolithographic Model: The papilloma (shaded) is exquisitely illustrated on a 1:1 scale model (Materialise, Belgium) with destruction of the left medial orbital, anterior cranial fossa and detailing its extension across the midline.

DISCUSSION

Dramatic technological advancements in the fields of medical imaging and computer aided design (CAD) in the past decade have enabled sterolithographic 3D modelling to evolve from a research aspiration to everyday reality.

The widespread availability of high-resolution volumetric data sets, providing isotropic imaging from cross-sectional imaging studies allows for exquisite 3D model production using rapid prototyping techniques.[1]

Although its domains are ever widening, its use is most established in the fields of oral maxillofacial (OMF) surgery and otolaryngology enabling surgical planning in anatomically complex areas which often require lengthy and complex surgery.[2] Similarly, in these fields the 3D modelling assists in prosthesis design and production with additional professional advantages such as teaching aids and aiding patient consent.

In this illustrative case a mass occupies the left ethmoidal and frontal sinuses with destruction of the floor of the anterior cranial fossa *(Figure 1 A,B)* with further delineation on MRI *(Figure 2 A,B)*. This case of an inverted papilloma illustrates the tremendous assistance that 3D modelling offers to the surgeon in examining the anatomical extent of the tumor, visualising their surgical approach and planning the operative procedure. *(Figure 3)* For example, in this case a combined procedure between the OMF and the neurosurgery departments was undertaken with a bifrontal craniotomy and maxillectomy. Operating times have also been shown to improve following the use of 3D models as preparation prior to surgery is more robust.[3]

REFERENCES

1. Rengier F, Mehndiratta A, von Tengg-Kobligk H, Zechmann CM, Unterhinninghofen R, Kauczor HU, Giesel FL. 3D printing based on imaging data: review of medical applications. *Int J Comput Assist Radiol Surg.* 2010 Jul;5(4):335-41.
2. Esses SJ, Berman P, Bloom AI, Sosna J. Clinical applications of physical 3D models derived from MDCT data and created by rapid prototyping. *AJR Am J Roentgenol.* 2011 Jun;196(6):W683-8.
3. D'Urso PS, Barker, TM, Earwaker WJ et al. Stereolithographic bimodelling in cranio-maxillofacial surgery: a prospective trial. *J Craniomaxillofac Surg* 1999; 27: 30-37.