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En bloc removal of the ethmoid and ostiomeatal complex in cadavers, with a practical application*†

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SUMMARY

Two different approaches, i.e. the anterior approach and the combined approach, for en bloc removal of the ethmoidal and ostiomeatal complex are described. In both techniques the contours of the face are completely maintained. Preliminary studies of prevalence of nasal polyps found by using these methods are described.

Key words: nasal anatomy, autopsy, ostiomeatal complex

INTRODUCTION

The endoscopic surgical treatment of nasal and paranasal sinus disease has recently attracted much enthusiastic attention. It is, therefore, increasingly important to have a well-defined picture of the normal anatomy of the ethmoid and ostiomeatal complex as well as the anatomical variations of the region. Furthermore, in order for appropriate medical, as well as surgical, intervention to take place it is of prime importance to conduct a systematic histological and histopathological investigation of the whole ethmoidal and ostiomeatal mucous membrane.

A variety of techniques are available for removing the ethmoid and ostiomeatal complex from cadavers (Belal, 1978; Bagatella, 1981; Rivron and Maran, 1991). With all of these methods it is important that the contours of the face are maintained for aesthetic reasons. By removing the complete complex *en bloc* the structure of the area is maintained.

Removal of the complex, whilst learning the technique, can be a time-consuming procedure. For this reason it is helpful to prefix the specimens prior to removal by inserting fixing fluid, eg. formalin, through the canine fossa into the maxillary sinus such that it will reach the maxillary sinus ostium and, subsequently, the middle meatus. Fixation of the ethmoidal cells, as well as their adjacent ostia, can be performed by further injection through the ethmoidal bulla. The rest of the mucous membrane, the middle turbinate, the medial surface of the uncinate process and the agger nasi are fixed by local submucous injection. Pre-fixing the specimen also allows the removal of the block to be delayed until such time as it is convenient for the surgeon to perform this duty.

METHODS

In this study we describe two methods of removing the ethmoid and ostiomeatal complex as well as the prevalence of nasal polyps in ten specimen, consecutively removed by this technique.

Anterior approach

The occipital, scalp and facial skin are detached until the cartilaginous part of the nasal skeleton is reached (Figure 1a). The cartilaginous part is separated from the bony nasal skeleton and remains in continuity with the facial skin. The bony nasal pyramid is then removed using a sharp drill and preserved (Figure 1b). The medial orbital content is freed from its bony wall and hereafter the orbital contents are retracted bilaterally. Then, both ethmoid and ostiomeatal complexes can be removod simultaneously using an extended cylindrical drill, the size depending on the size of the naso-ethmoidal complex..

The resulting cavity is then filled and the preserved bony nasal pyramid replaced. After the nasal cartilage with the attached skin has been repositioned, the skin is draped over the bony pyramid and back over the cranium. If the skin across the nose gives the impression of a broad bridge, collodium (Kollodium Dan 48) can be used to attach the skin to the medial canthus on each side.

Combined approach

The occipital and scalp skin are freed from behind forwards until the supraorbital ridges are reached. The bony cranial vault is removed and the brain removed. The dura mater of the anterior cranial fossa is then carefully removed. The frontal sinus is

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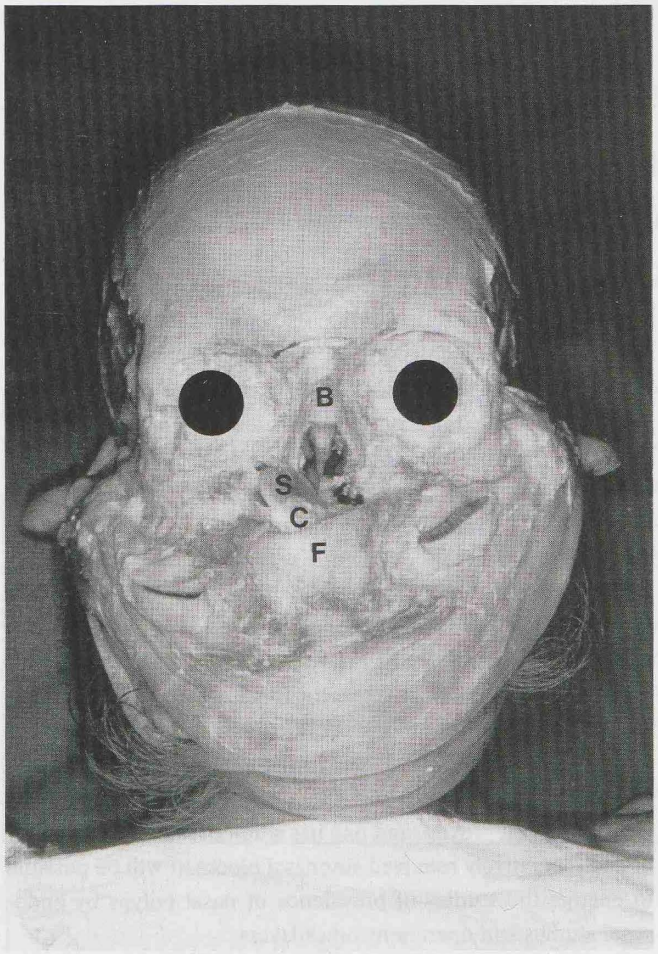

Figure 1a. Anterior approach. Facial skin has been removed until the cartilaginous part of the septum was reached (B: bony nasal pyramid; S: nasal septum; C: cartilaginous part of nasal skeleton; F: facial skin from bony nasal pyramid).

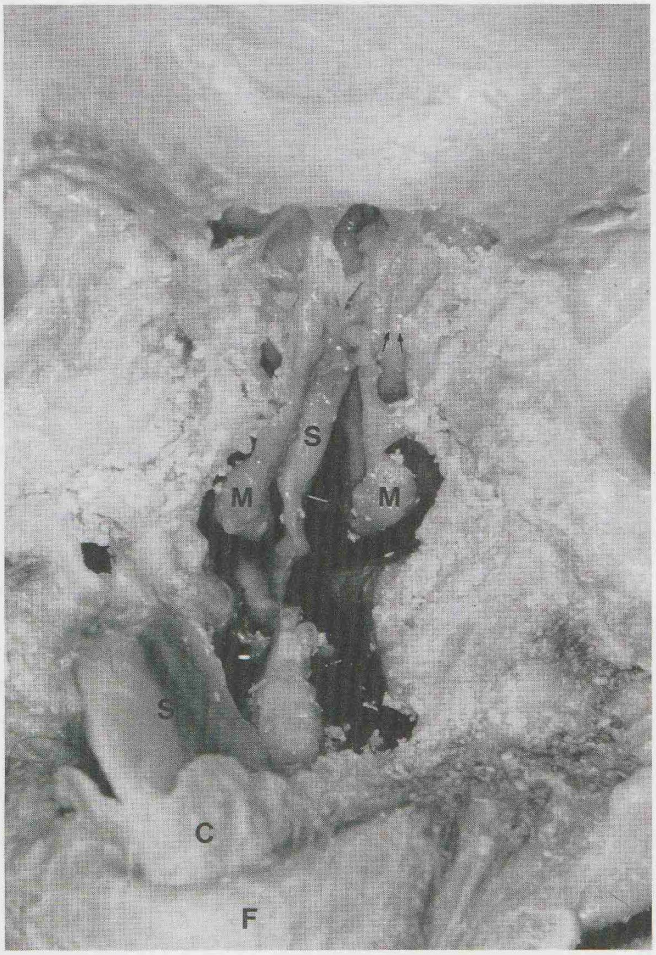

Figure 1b. Same patient as Figure 1a. The bony nasal pyramid has been removed (S: septum; M: middle turbinate; C: cartilaginous part of facial skeleton; F: facial skin from bony nasal skeleton; arrows: frontal recess).

widely de-roofed with the drill using a cutting burr, at the midline the frontonasal ducts will be noticed; similarly the sphenoid sinus is de-roofed. Again, using a cutting burr a communication is established on each side between the lateral part of the frontal sinus and the sphenoid sinus, creating a triangular shape (Figure 2). The superior orbital wall will be opened, and fat exposed, during this part of the procedure. Opening of the lateral projections of the ethmoid cells which occur anteriorly must be carefully avoided.

The cadaver is repositioned at this stage and a sublabial incision is performed. Using a periosteal elevator the anterior facial skin is elevated from the premaxillary region and the anterior nasal spine. The septum is then cut vertically from below and the cartilaginous part of the nose can be lifted up superiorly, opening the pyriform aperture as far up as the nasal bones. A clear view of the nasal cavity is now evident and the septum can be freed along its entire floor.

The anterior wall of the maxillary sinus is widely fenestrated preserving the medial bony buttress of the pyriform aperture which is formed by the frontal process of the maxilla. The maxillary sinus ostium should now be clearly visualized and preserved as part of the bony lateral nasal wall. Using punch forceps the orbital floor is opened along an antero-posterior plane in the middle of the sinus roof. In order to separate the lateral nasal wall from the floor of the nasal cavity, the mucosa is initially dissected from the bone along the inferior meatal wall. The bone and mucosa are then independently cut horizontally.

The cadaver is again repositioned so that the anterior cranial fossa is visualized. The orbital contents are now dissected carefully from the medial orbital wall until the opening in the roof of the maxillary sinus is reached. In order to prevent damage to the fragile ethmoidal cells, careful lateral retraction of the orbital content is necessary and an operating microscope may be helpful at this stage. The floor of the frontal sinus is opened along the front of the block along a line just anterior to the frontonasal ducts, angling the drill slightly posteriorly to prevent damage to facial skin. Using a cutting burr the posterior edge of the block is freed by cutting along the floor of the sphenoid sinus opening into the nasal cavity. The posterior part of the septum can be cut vertically, down to its freed inferior edge. Any remaining attachments, especially at the angles of the block are divided and the specimen is lifted out superiorly.

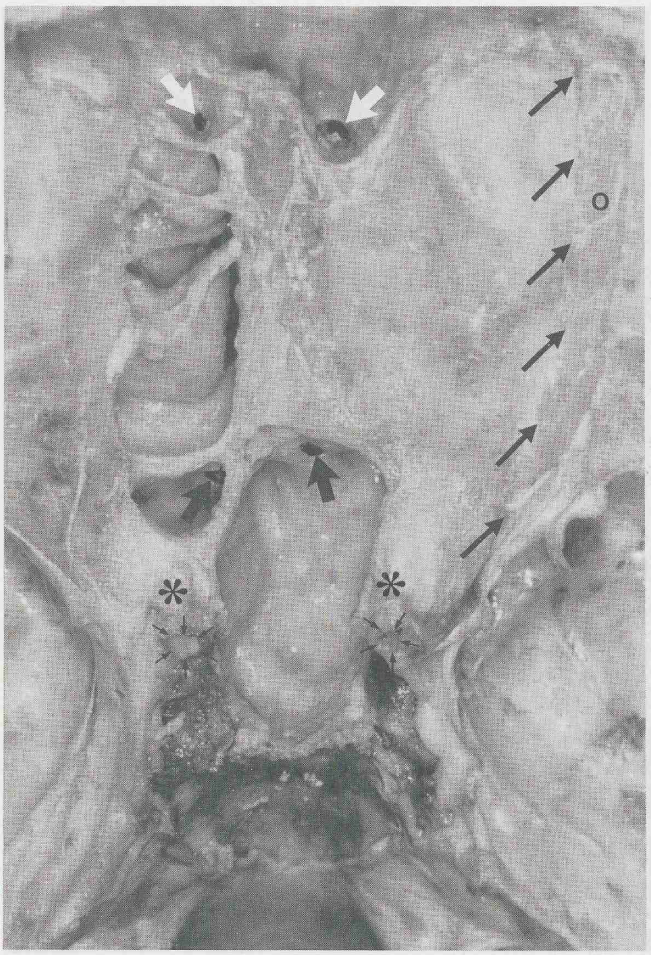

Figure 2. Combined approach. Frontal sinus, ethmoidal cells and sphenoid sinuses has been opened for a better view (O: orbital fat; long arrow: drilled communication line between frontal and sphenoid sinus; broad white arrow: frontal nasal duct; broad black arrow: sphenoid sinus ostium; small arrows: internal carotid artery; asterisk: optic nerve).

PRACTICAL APPLICATIONS

The naso-ethmoidal complex of a cadaver can be used to familiarize the rhinosurgeon with endonasal surgical techniques. If one then removes the ethmoidal and ostiomeatal complex as described it will allow precise examination and critical analysis of the surgical result.

The procedure of ethmoidal and ostiomeatal complex removal also allows for the systematic investigation and mapping of the macro- and microscopical anatomy of this region. This will include the histopathological findings within the middle meatus, the ethmoid cells and around the maxillary sinus ostium. Information will also be derived regarding the general status of the ethmoidal cells and pathological changes within the ostiomeatal complex including the origin and prevalence of nasal polyps.

Recently, we have done random screenings for nasal polyps by anterior rhinoscopy in 300 corpses over a 2-year period (Larsen and Tos, 1992). The blocks were removed by different methods, of which we found the two described in this paper of the highest value. Polyps were found in 6 of 300 corpses, corresponding to prevalence of nasal polyps of 2%. A small preliminary study concerning the prevalence of nasal polyps was done by consecutive anterior and/or combined approach removal of 10 specimen. Small nasal polyps were found in two of the blocks (20%). As in the previous study the polyps were localized around the ethmoidal cell ostia. Although any conclusions from this preliminary study can not be drawn, it seems that the prevalence of nasal polyps is much higher than previously supposed. One needs a larger group to draw any conclusions about the actual prevalence of nasal polyps.

It can be difficult to get sufficient block material, especially if the relatives object to autopsies or opening of the skull, or if the personnel at the Pathology Department are busy, and you need their assistance. But gradually as the endonasal surgery technique has been proven, and one has studied a sufficient amount of post-operatively removed sinonasal blocks, it will be possible to enlarge the studies of prevalence of nasal polyps by endonasal studies and operations on cadavers.

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