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# The 'swing-door' technique for uncinectomy in endoscopic sinus surgery

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**Abstract**

Uncinectomy is an important step in endoscopic sinus surgery. The traditional method of performing uncinectomy has the risk of penetration of the lamina papyracea with orbital fat exposure. If the orbital penetration is not recognized, major complications may follow. In this study the authors used historical consecutive controls to compare the incidence of orbital penetration, identification of the natural ostium and lacrimal apparatus injury by the traditional surgical technique and a new technique of uncinectomy. Six hundred and thirty-six uncinectomies have been performed using the 'swing-door' technique. The 636 uncinectomies performed prior to changing techniques were used as historical controls. The incidence of orbital penetration (six compared to 0; $p<0.05$) and ostium non-identification (42 not identified as compared to 0; $p<0.001$) was significantly less with the new technique. One lacrimal injury occurred with the 'swing-door' technique compared to zero with the standard technique ($p>0.05$). The techniques are described and the complications discussed. The authors recommend this technique as it is easy to learn, allows removal of the uncinate flush with the lateral nasal wall and allows easy identification of the natural ostium of the maxillary sinus.

**Key words: Surgery, operative; Endoscopy; Paranasal sinuses**

## Introduction

Sinus surgery has undergone enormous change in the last decade. This is due largely to the work of Messerklinger (Messerklinger, 1978) and Stammberger (Stammberger, 1986) in their description of the normal muco-ciliary drainage pathways of the sinuses and has led to the development of the concept of restoration of normal sinus function by limited surgery (functional endoscopic sinus surgery or FESS) (Stammberger, 1986). The uncinate is curved like a sabre with a length of between 19 and 32 mm (Wake *et al.*, 1994). Anteriorly it is continuous with the ethmoid bone and superiorly may attach to the lamina papyracea, skull base or middle turbinate. Postero-inferiorly it articulates with the medial wall of the maxillary antrum via its maxillary process and with the ethmoid process of the inferior turbinate. The gap between the upper border of the uncinate and the bulla ethmoidalis is the hiatus semilunaris. This opens into the ethmoid infundibulum, which contains the natural ostium of the maxillary sinus.

The traditional method for performing uncinectomy is as follows: the nose is decongested and the middle turbinate and the mucosa anterior to the uncinate is infiltrated (Stammberger, 1986; Rice, 1995; Clerico *et al.*, 1996). The base of the uncinate is incised from superior to inferior with a sickle knife (Stammberger, 1986; Rice, 1995; Clerico *et al.*, 1996). The incision is started in the groove where the uncinate joins the lateral nasal wall. During the incision the incinate is pushed medially by the sickle knife to facilitate removal with a Blakesley forceps (Rice, 1995). As the incision is continued inferiorly it should also be taken further posteriorly along its insertion into the base of the inferior turbinate (Clerico *et al.*, 1996).

The uncinate should be grasped superiorly with the Blakesley forceps and rotated down during removal (Clerico *et al.*, 1996). The aim is usually two-fold, firstly to reveal the natural ostium of the maxillary sinus and secondly to open up the middle meatus should further ethmoid surgery be required.

Although this standard method of performing uncinectomy is effective, it has associated risks. The uncinate is usually recognized by palpation with movement of its free edge. In spite of movement of the free edge, it may be difficult to define its insertion into the lateral nasal wall. If the incision into the uncinate is attempted flush with the lateral nasal wall, there is an increased risk of penetrating the orbit (Figure 1). This risk further increases if an anatomical variation is present. The two most dangerous variations are a laterally curved or

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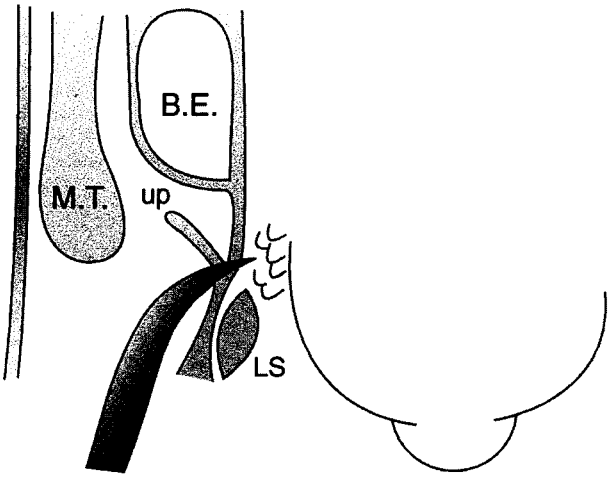


FIG. 1

Axial cut through the anterior nose and eye illustrating entry of sickle knife into orbit on incision of the base of the uncinate process.

Key for all figures

UP = uncinate process, LS = lacrimal sac, BE = bulla ethmoidalis, MT = middle turbinate, H.K.P. = Hajek Koeffler punch.

flattened uncinate that is closely applied to the lamina papyracea (Figure 2) and a rudimentary or small uncinate (Figure 3). These variations bring the sickle knife in close proximity to the lamina papyracea with a risk of orbital penetration. In addition, a hypoplastic maxillary sinus or the absence of anterior ethmoidal air cells may also bring the sickle knife in close proximity to the lamina papyracea with an increased risk of orbital penetration. The authors propose a new method for performing an uncinectomy that allows the uncinate to be removed flush with the lateral nasal wall and the natural ostium of the maxillary sinus to be easily identified.

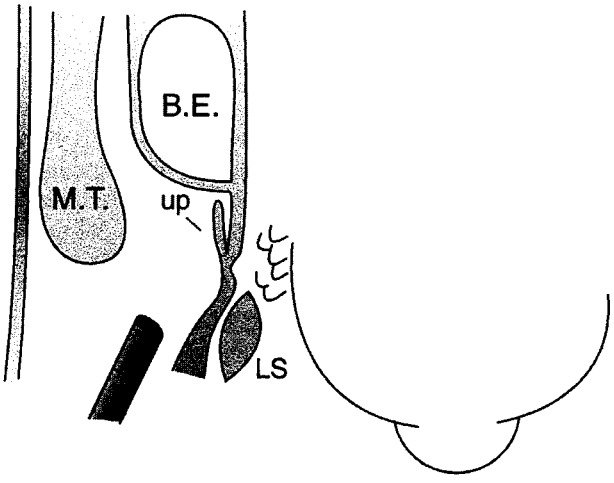


FIG. 2

Axial cut through the anterior nose and eye illustrating the close proximity of lamina papyracea and uncinate process in a laterally displaced uncinate.

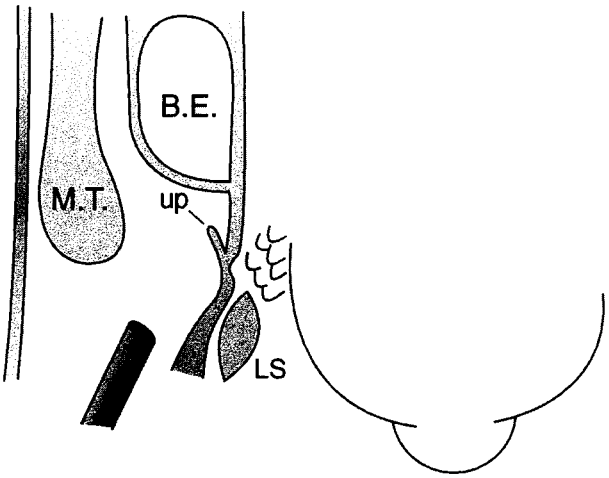


FIG. 3

Axial cut through the anterior nose and eye illustrating how an underdeveloped uncinate's insertion may be difficult to determine when viewed endoscopically.

## Materials and methods

Since the authors changed their technique, the 'swing-door' technique has been used in all uncinectomies (total of 636 uncinectomies). To compare the number of orbital penetrations, naso-lacrimal duct injuries and the ease of finding the maxillary sinus ostium using the two techniques, the 636 consecutive uncinectomies in the period immediately prior to the change in technique were selected as historical controls. No patients were excluded. As the surgeons' practices have not changed, the pathological mix of cases in the consecutive controls was similar to the cases operated on using the 'swing-

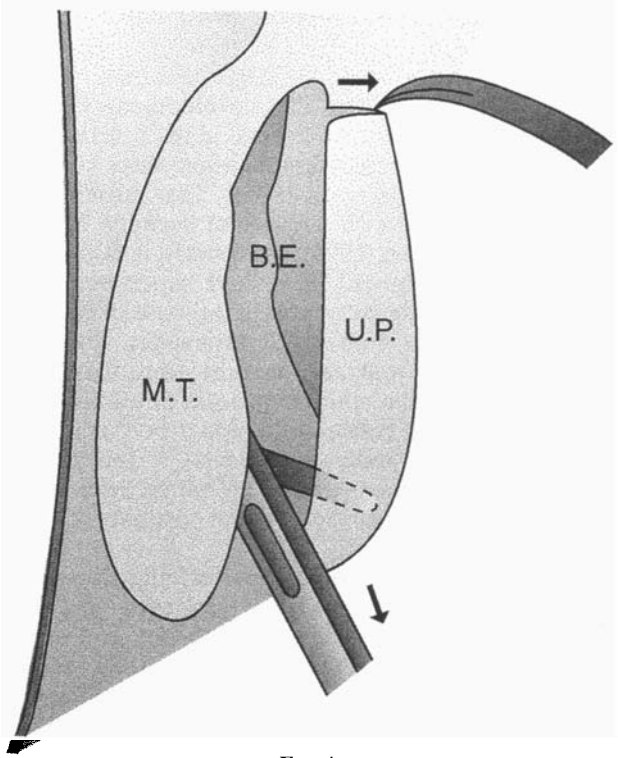


FIG. 4

Superior incision of the uncinate with a sickle knife and inferior incision with a backbiting antrum punch.

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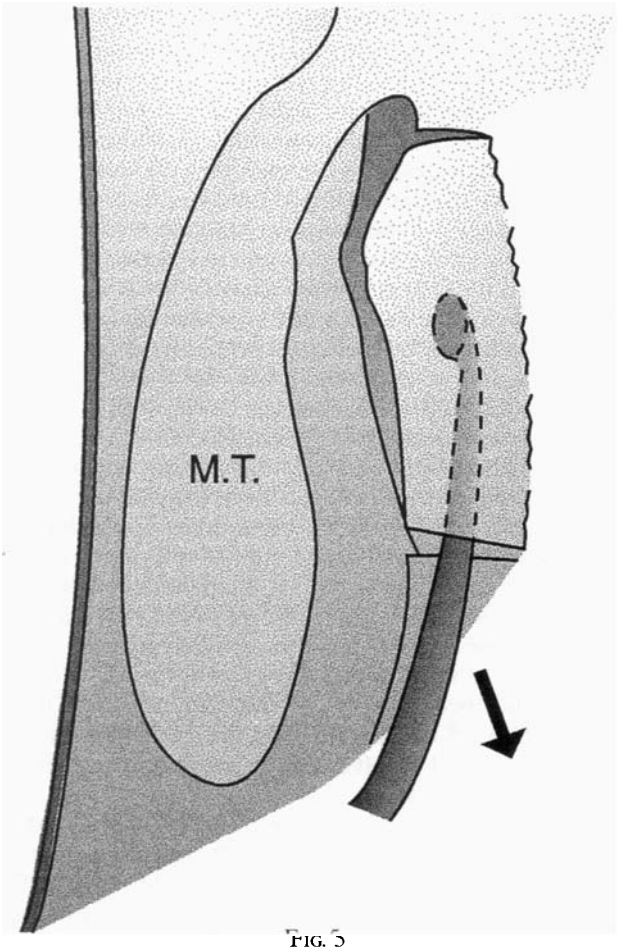


FIG. 5

The uncinate process is fractured anteriorly with a 45° Kuhn spoon or a blunt right-angled hook.

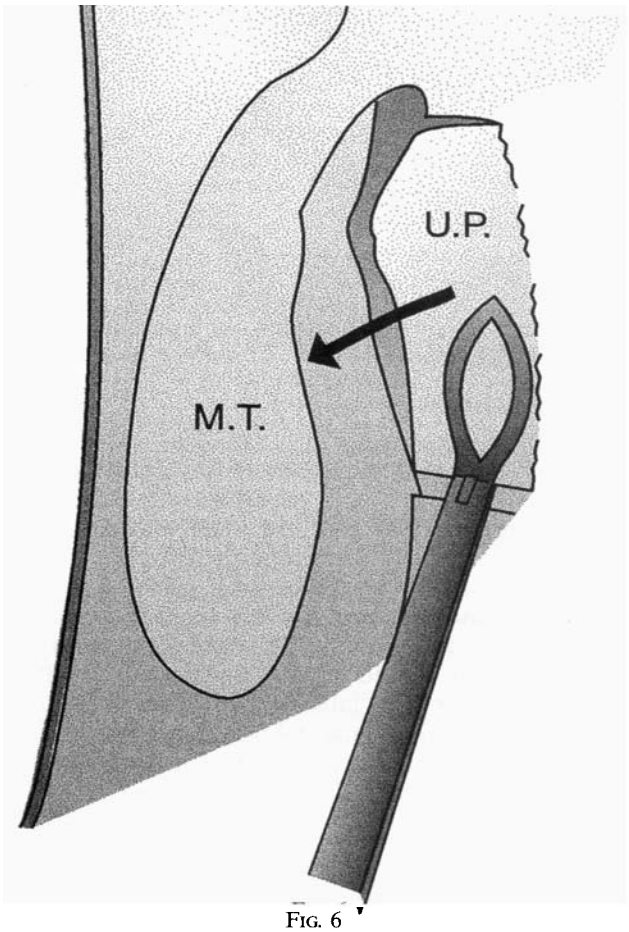


FIG. 6

The uncinate process is removed with a 45° Blakesley forceps. The forceps should be placed as high and as laterally as possible on the uncinate process.

door' technique. The traditional method of performing an uncinectomy used in the controls has been described. The 'swing-door' technique is as follows:

The uncinate is identified by palpation. A sickle knife is used to incise horizontally across the uncinate in the axilla of the middle turbinate (Figure 4).

A back-biting antrum punch is passed beyond the uncinate, opened and pulled gently backwards until the opened punch engages the uncinate (Figure 4). If the uncinate is a normal size, a further bite with the punch is usually required before the uncinate is cut to its insertion on the lateral nasal wall. The punch should be superiorly rotated until it is almost vertical for this second bite. This vertical rotation brings the punch medial to the naso-lacrimal duct. Care must be taken to engage the uncinate as low as possible otherwise the horizontal portion of the uncinate may remain and obscure the natural ostium. In addition the surgeon should not close the back-biting punch if there is moderate or marked bony resistance as this hard bone is the frontal process of the maxilla that covers the naso-lacrimal sac and duct.

In order to fracture the uncinate at its insertion to the lateral nasal wall, a Kuhn spoon (45°) or right-angled blunt probe is inserted through the cut uncinate and the uncinate bone engaged. The spoon or probe is pulled anteriorly fracturing the uncinate bone flush with the lateral nasal wall and swinging the uncinate anteriorly (Figure 5). This 'swing-door' is the middle third of the uncinate that has been swung forward allowing it to be easily grasped by the Blakesley forceps. The 'swing-door' is grasped flush with the lateral nasal wall with either a 45° Blakesley forceps or through-cutters and the uncinate is removed in one piece (Figure 6). Use of the 45° Blakesley through-cutters may reduce

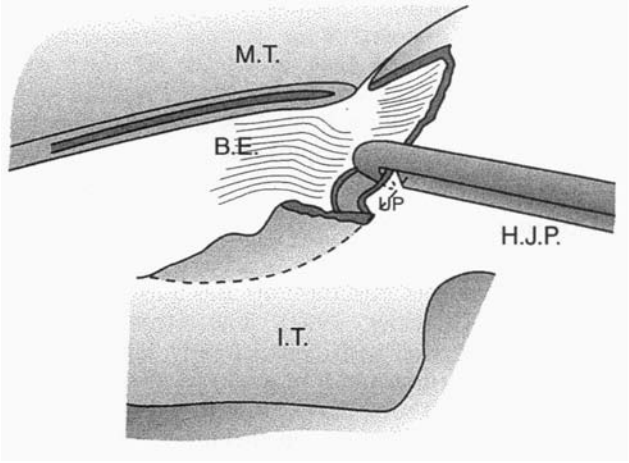


FIG. 7

A Hajek Koeffler sphenoid punch is used to remove any residual pieces of uncinate process to fully expose the infundibulum.

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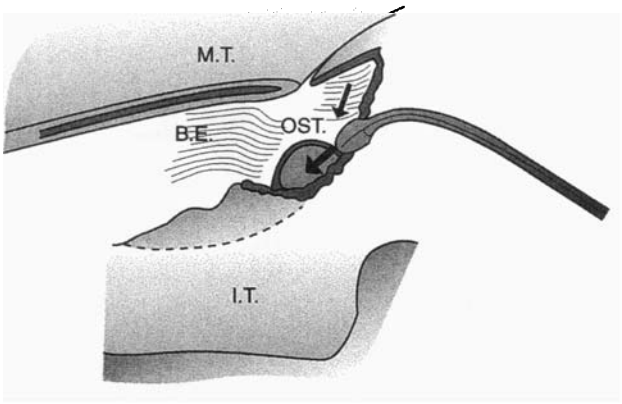


FIG. 8
A curved olive tip suction is passed down the infundibulum until it falls into the natural ostium of the maxillary sinus.

mucosal tearing and bleeding. The endoscope is changed to a 30° endoscope and the cut edge of the uncinate viewed. A back-biting Hajek-Koeffler sphenoid punch is used to remove any residual uncinate (Figure 7). The infundibulum is now exposed and a curved suction is passed down the infundibulum until it 'falls' into the natural ostium (Figure 8). Even if the natural ostium is obscured by inflamed mucosa, gentle palpation using this method should locate the natural ostium with ease.

## Results

There were six orbital penetrations with fat exposure in the 636 uncinectomies performed using the traditional uncinectomy technique. No lacrimal duct injuries were identified during or after these procedures and no patients developed post-operative epiphora. The natural ostium of the maxillary sinus was unable to be located in 42 uncinectomies and the initial opening into the maxillary sinus was performed through the posterior fontanelle with anterior enlargement.

In the subsequent 636 uncinectomies using the 'swing-door' technique, there were no orbital penetrations (Fischer exact test $p<0.05$) and all natural ostiums were identified (Fisher exact test $p<0.001$). However, one naso-lacrimal duct was opened and five exposed without injury (Fischer exact test $p>0.05$). An exposed duct is not considered a complication. In the case in which the duct was opened, the opening was widened and stented with Gelfoam®. The ostium healed as a dacriocystorhinostomy ostium without epiphora.

## Discussion

Endoscopic sinus surgery is gaining in popularity and becoming the procedure of choice for intranasal procedures (Mackay, 1992). The attractions are better visualization with consequently safer limited and extensive intranasal procedures (Stankiewicz, 1987). The authors have found the described technique for performing uncinectomy safe, with a significantly decreased incidence of orbital penetration in their hands. The incidence of orbital penetration of the traditional technique used in the first 636 uncinectomies (<one per cent) is comparable to incidence reported in the literature. The incidence in the literature varies from 0.6 to 7.2 per cent with an average incidence of 1.5 to two per cent (Stankiewicz, 1987; Schaefer, 1989; Schaefer *et al.*, 1989; Stankiewicz, 1989; Levine, 1990; Vleming *et al.*, 1992; Kinsella *et al.*, 1995). However, it should be noted that orbital penetration without orbital haematoma or ecchymosis is often not reported as a complication (Rice, 1995; Clerico *et al.*, 1996). Orbital penetration with fat exposure is generally not considered a serious complication if it is immediately recognized (Messerklinger, 1978; Stankiewicz, 1987; Stankiewicz, 1989; Wake *et al.*, 1994; Kinsella *et al.*, 1995; Rice, 1995).

If, however, the surgeon does not recognize penetration, serious complications may arise. Once orbital fat is seen, the surgery should be discontinued and the eye examined. If the pupil is reactive to light, if there is no subconjunctival haemorrhage and no proptosis, surgery is continued without manipulation of the exposed orbital fat. Post-operatively there will usually be a varying amount of peri-orbital ecchymosis and occasionally orbital emphysema. The patient should be advised that the ecchymosis and emphysema will resolve and to avoid blowing their nose for two weeks.

The usual purpose of an uncinectomy is to identify and expose the natural ostium of the maxillary sinus. Once the ostium is identified the surgeon can then decide whether enlargement of the natural ostium is necessary or not. Using the proposed technique the natural ostium of the maxillary sinus was easy to identify and manipulate if necessary. Retrograde removal of the uncinate process has been previously described (Setcliffe, 1996). With this technique a window is removed from the uncinate with the back-biting punch until the natural ostium of the maxillary sinus is visualized. There are other techniques described for removal of the uncinate and locating the natural ostium. A blunt sucker or instrument can be used to ballot the area directly above the insertion of the inferior turbinate. This allows the posterior membranous fontanelle of the maxillary sinus to be identified. This can be opened with a back-biting punch or 90° Blakesley forceps. This ostium is then enlarged anteriorly until it joins the natural ostium (Schaefer, 1989; Schaefer *et al.*, 1989). It is important that the natural ostium be incorporated in the created middle meatal antrostomy to avoid circuitous flow of mucous and re-infection as this is a major reason for revision surgery (Duncavage, 1995; Schaitkin and May, 1995).

In the series of uncinectomies using the new technique one lacrimal duct was opened in comparison to no observed lacrimal apparatus injuries in the historical controls. This incidence (<one per cent) compares favourably with the reported incidence of less than one per cent (Levine, 1990; Vleming *et al.*, 1992; Kinsella *et al.*, 1995). It should be noted that an injury to the naso-lacrimal apparatus may not always be recognized at the time of surgery unless the patient develops post-operative epiphora (Serdahl

*et al.*, 1990; Rice, 1995). A minor injury may heal without stenosis to the naso-lacrimal duct therefore not cause post-operative symptoms (Rice, 1995). In the patient in whom the naso-lacrimal injury was identified, the uncinate was solidly ossified and very underdeveloped which made seating of the back-biting punch difficult. More force than normal was used in an attempt to seat the punch and after cutting the uncinate the opened duct was visible. This could have been avoided if the anatomical variation had been recognized on CT and additional force had not been used. In addition five lacrimal ducts were exposed without injury. Although this is not a complication it illustrates that removal of the uncinate flush with the lateral nasal wall puts the surgeon in close proximity to the lacrimal sac and duct. The technique of turning the blade of the backbiting antrum punch vertically for the second bite should lessen the risk to the nasolacrimal duct as it brings the blade medial to the duct.

The authors recommend this technique as it is easy to learn and to perform, it allows the uncinate to be safely removed flush with the lateral nasal wall and allows wide exposure of the infundibulum and identification of the natural ostium of the maxillary sinus.

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