Title Page Operative nuance:

The conversational position in endoscopic pituitary surgery

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Disclosure of funding:

Nil

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Technical note:
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Abstract

We describe a novel patient position for endoscopic transphenoidal surgery – the 'conversational position'. This position is a safe and effective alternative to the standard supine position, incorporating a semi-sitting position with the additional innovation of achieving a 'conversational position' by flexing the neck and turning the patient's head turned to face the surgeon. The 'conversational' position offers improvements in the surgical approach to sellar region, addressing specific intraoperative challenges such as maintaining a bloodless operative field, and enabling more intuitive and ergonomic surgical workflow.

Introduction

The use of endoscopes for transphenoidal approaches in neurosurgery has become routine, and is associated with improved surgical outcomes[1]. Although endoscopic transphenoidal surgery has undergone a series of refinements to the operative technique, patient positioning has not been systematically addressed. In routine endoscopic transphenoidal surgery, surgeons typically stand by the patient's head, or by the side of the patient's shoulder, with the patient fully supine. Here, we propose the use of a 'conversational position' for endoscopic transphenoidal surgery that utilises a semi-sitting position with additional positioning of the head, which has not been previously described. We specifically describe flexing and turning the head to face the surgeon, providing more direct access into the nares with the endoscope. These modifications to patient positioning improve operating conditions by enabling a bloodless operative field, superior ergonomics for application of endoscopic instrumentation, and a more intuitive intraoperative set-up. We outline the key attributes of this operative nuance, and discuss in detail how performing surgery in this position helps to optimise intraoperative surgical conditions.

Methods

The described technique has been employed in 350 endoscopic transphenoidal cases, including extended approaches. The conversational position is achieved by first placing the patient supine. The table is then separated or 'broken' to achieve the semi-sitting position with the head turned to the right i.e. pointing towards the surgeon. The patient's head is supported on a Mayfield^{R} headrest (Integra Life Sciences, Plainsboro, New Jersey) (Fig. 1A), unless navigation is required (Fig. 1C). The neck is flexed and gently rotated, until the patient is looking directly at the surgeon. (Fig.1A). These specific adjustments differentiate the position from a standard semi-sitting position, or simply raising the head of the patient. A direct line-of-sight and operative access to the back of the nares and the sphenoid fossa is achieved, and endoscope-linked monitors can be positioned behind the patient's head, in the direct line of the surgical approach (Fig. 1B, E, F). This is more intuitive than switching views to look down onto the patient e.g. during intraoperative instrument application. Following the securing of the patient in the chosen operative position, an endoscopic holding arm is placed on the left of the patient.

If the procedure requires frameless stereotaxy (e.g. extended transphenoidal approaches) (Fig. 1D) the patient's head can be fixed using a Mayfield^{R} head clamp and pins (Integra Life Sciences, Plainsboro, New Jersey) (Fig .1C). The monitors for navigation are positioned on the right of the surgeon (Fig. 1E). In extended procedures where significant CSF egress may be anticipated, the position is made more recumbent, with the head elevated to reduce pneumocephalus.

Discussion

Endoscopic transphenoidal surgery is recognised as being technically challenging, with an associated learning curve. Achieving an optimal patient position is a crucial step in any surgical workflow, and particularly important for endoscopic transphenoidal surgery. Positioning is associated with mechanical and physiological consequences to the patient[2], including changes in intracranial pressure and systemic blood pressure. From the surgeon's perspective, he/she must be comfortable in the operating position for potentially prolonged periods of time. What is absent in endoscopic pituitary surgery however, is a standardised approach to positioning that takes these requirements into account. We report a new operative position for endoscopic transphenoidal surgery that provides improved ergonomics (see workflow Fig. 2), as well as addressing specific intraoperative challenges which occur during endoscopic transphenoidal surgery.

The conversational position requires placement of the patient in a semi-sitting position, with the addition of having the patient's head flexed and turned to the side of the surgeon (Fig 1A). As a result, the hands of the surgeon are placed in a more intuitive position in relation to the direction of surgery and viewing monitors, with less obscuration of the operative field. There is less of a 'pull' on the instruments into the field, resulting in less user-fatigue. This prevents unintended 'sinking' or 'plunging' of instruments into the operative field. Blood and irrigation will tend to pass down and out of the nose, rather than pooling, serving to reduce staining of the endoscope tip, and reducing the use of irrigation, improving visualisation during surgery.

Surgery is performed in a relatively confined space, with the potential for frequent conflict between instruments and the endoscope, depending on the level of skill of the operator. Movement of the endoscope is anatomically limited by the nasal vestibule, middle turbinate, nasal septum, and the morphology of the sphenoid ostium and posterior ethmoids. Obtaining a surgical position that maximises surgical access, and optimises intraoperative tissue handling in the sellar/ parasellar region is therefore important. By turning the head of the patient to face the operator in the conversational position, a more comfortable and intuitive placement of the operator's

arms in relation to the nares is achieved, with a contingent effect on the introduction of instruments into the nose, and ease of surgical manoeuvrability during surgery.

Bleeding during endoscopic transphenoidal operations may be minor from the nasal mucosa, or can be significant from the anterior ethmoidal artery, cavernous sinus or internal carotid artery. The latter is relatively infrequent during endoscopic pituitary surgery (0.5%-1.1%) but has a higher incidence during extended endoscopic cases (4.5%-9%)[3]. The resulting obscuration of the endoscopic field of view may result in blind nasal packing, which is itself associated with morbidity and mortality. Therefore, procedural modifications which assist with controlling intraoperative bleeding, such as use of the conversational position are useful. Blood-flow out of the operative field results in better intraoperative visualisation, and facilitates easier access to bleeding points. These factors are particularly advantageous during extended procedures, with involve larger operative exposures (e.g. middle turbinectomies, cavernous sinus entry, transplanum approaches), and longer operative times.

The senior author has also instituted the use of a holding arm to temporarily fix the endoscope (Fig. 1B,) facilitating a single surgeon procedure. This is particularly useful during extended approaches which would normally involve a four handed technique. Recent work has examined the feasibility of a foot-controlled, robotically-enabled holder for the endoscope which may enable single surgeon real-time adjustment of the endoscope without having to interrupt surgery.

References

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Figure legends

Fig 1. A. Patient's head is placed on the Mayfield headrest for simple transphenoidal surgery- note the neck is flexed, and head is raised and turned towards the operating surgeon, in a 'conversational manner'. B. Standard set-up for endoscopic transphenoidal surgery (including use endoscopic holding arm) C. Patient's head is placed in Mayfield clamps, which enables frameless stereotaxy paired with a surgical navigation camera. This approach is used for pathology requiring extended surgical access D. Positioning of surgical navigation camera for frameless stereotaxy. E. Intraoperative positioning of monitors for i) endoscope and ii) intraoperative navigation, in (red numbers). F. Intraoperative view showing patient position, surgeon positions and equipment set-up. Note: hand position of operating surgeon. The patient's head is turned to face the surgeon, with the neck slightly flexed.

Fig 2. Schematic of the intraoperative work-flow.

P= patient SN = scrub nurse, S1= principle surgeon, S2 = assistant surgeon.