Suturing and Closure of Diaphragma Sella to Augment Sellar Floor Repair after Endonasal Endoscopic Resection of Large Pituitary Adenoma

Sushanta K. Sahoo¹  Murali K. Bethanbhatla¹  Sivashanmugam Dhandapani¹

¹Department of Neurosurgery, Postgraduate Institute of Medical Education and Research, Chandigarh, India

Address for correspondence Sushanta Kumar Sahoo, MCh, Department of Neurosurgery, Postgraduate Institute of Medical Education and Research, Chandigarh 160012, India (e-mail: drsushantsahoo@gmail.com).

Abstract

Background  Large pituitary adenoma often pushes the diaphragma sella and extends to the suprasellar compartment. The thinned out diaphragma may get opened during endonasal endoscopic surgery and pose high risk for cerebrospinal fluid (CSF) leak. Such larger defects are difficult to plug with fat graft that tends to slip in to the subarachnoid space. Here, we describe a unique technique of closure of diaphragma sella that augment repair of the skull base in such cases.

Materials and Method  The free edge of diaphragma sella was sutured with the anterior tuberculum sella dura in five cases of large pituitary adenoma that needed extra arachnoidal resection. Suturing was done with 6-0 prolene using endoscopic needle holder that converted a large diaphragm defect in to a smaller arachnoid rent and was easily plugged with fat graft.

Result  None of these patients had postoperative CSF leak.

Conclusion  Though technically difficult, direct repair of the diaphragma sella is possible. This augments the skull base reconstruct and effectively reduces the chances of postoperative CSF leak.

Introduction

Sellar suprasellar lesions like pituitary adenoma often push the diaphragma sella upwards and often invade the arachnoid.¹ Endonasal endoscopic excision of such tumors may result in complete opening of the diaphragm that poses great difficulty in sellar floor repair. There are several techniques of sellar floor repair like bath plug of fat graft, overlay fascia lata graft, vascularized flap, and use of fibrin glue that have been discussed in the literature.²,³ However, use of vascularized nasoseptal flap is not in routine practice for resection of pituitary adenoma. Here, we discuss a unique technique of suturing the diaphragm sella with the tuberculum sella dura to augment sellar floor repair in five cases of large pituitary adenoma that successfully prevented postoperative cerebrospinal fluid (CSF) leak.

Technical Details

Five patients with large sellar suprasellar pituitary tumor operated through endonasal endoscopic approach, where endoscopic direct suturing and closure of the open...
diaphragma sella was done, were included in this analysis. All patients had visual field deficit and two were hypocorti-
solic in the preoperative period. Contrast magnetic reso-
nance imaging showed large sellar suprasellar tumor and one of them had subfrontal extension (►Fig. 1A, B).

Apart from standard sellar floor opening the bony drilling included the tuberculum sella anteriorly and the anterior normal dura was exposed in all cases. Tumor resection was done in standard fashion using ring curette. Extra arachnoi-
dal dissection was done in all the cases to remove the anterosuperior extension of tumor. At the end of resection vessels of anterior circulation with the optic apparatus were visualized through the open diaphragm.

In all these cases the arachnoid opening was present at the anterior aspect and the edge of the diaphragm sella dura was intact posteriorly (►Figs. 2A and 3A). The diaphragm was then sutured with the tuberculum sella dura anteriorly or the skull base dural laterally. The suturing was performed with a 6-0 prolene using endoscopic needle holder. Direct endo-
scopic suturing was done in four-step technique. First, the needle was passed through the free edges of the diaphragm sella (►Figs. 2B and 3B). Then, the needle was passed through the dura of the tuberculum sella (►Figs. 2C, G and 3C, D). In

**Fig. 1** (A, B) Sagittal and coronal T2-weighted (T2W) magnetic resonance imaging showing sellar suprasellar lesion with subfrontal extension. Note the elevated and stretched out diaphragm sella (red arrows) over the dome of the tumor. (C, D) Postoperative magnetic resonance image (C, postcontrast sagittal; D, T2W coronal) showing excision of tumor with fat graft in the cavity.

**Fig. 2** Intraoperative image showing completely disrupted anterior arachnoid with free edge of diaphragm (yellow star). Note first suture passed through the free edge of diaphragm sella (A). (B–D) Image showing suture through the anterolateral tuberculum sella dura which was finally tightened. (E, F) Image showing suturing the diaphragm sella with the left lateral skull base dura. (G) Image showing multiple sutures (yellow arrows) in place holding the edges of diaphragm sella. (H, I) Image showing fat packing of the sella.
the third step a knot was placed outside the nostril and
pushed gently in to the operative
field (►Figs. 2C and 3D). Finally, the suture was tightened and cut. In all our cases we
could able to convert the large diaphragma defect to a small
arachnoid opening (►Figs. 2G and 3E). Then, the relatively
smaller defect was plugged with fat graft and multilayer
closure was done with overlay autologous fascia lata graft
and tissel glue (►Figs. 2H, I and 3F).
Postoperative radiology showed complete tumor excision
in all cases (►Fig. 1C, D). None of the patients had CSF
rhinorrhea in the postoperative period.

Discussion
Suprasellar extension of pituitary adenoma was previously
considered an indication for intracranial approach. However,
with the advent of better optics, angled endoscopes, and
angled instruments suprasellar components are successfully
operated by endonasal endoscopic approach.5 Goel et al
described the growth pattern of suprasellar pituitary ade-
noma in relation to the diaphragma sella. They concluded
the diaphragma sella gets elevated and expanded over the
dome of the suprasellar component of adenoma not neces-
sarily invaded by the tumor.1 Further, the diaphragma
sella may be disproportionately thinned out at places and
allows the lobular extension of tumor. Endonasal endo-
scopic excision of such large pituitary adenoma often
results in the opening of the thinned out diaphragm. This
may directly communicate with the subarachnoid space
and often the third ventricle and poses a significant risk of
postoperative CSF leak. Again, fat plugging of the sella at
times becomes difficult owing to the large defect and
pulsatile flow of CSF. Here, we have used the edges of
diaphragma sella to close the suprasellar defect. By sutur-
ing the diaphragm with the anterior tuberculum sella dura
the larger suprasellar defect converted to a relatively
smaller sellar defect. The repaired diaphragm thereby
reduces the pulsatile flow of CSF and further allows better
plugging of the defect with fat graft. None of our patients
had postoperative CSF leak which reflects the efficacy of a
repaired diaphragm sella.

Conclusion
Though technically difficult, direct repair of the diaphragma
sella is possible. This effectively reduces the chances of
postoperative CSF leak.

Authors’ Contributions
S.K.S.: Concept and design, collection of data, manuscript
drafting, and reviewing; M.K.B.: Collection and collation
of data, and final approval of manuscript; S.D.: Collection
of data, manuscript drafting, and reviewing.

Conflict of Interest
None declared.
References