TECHNICAL NOTE

Easy Sellar Reconstruction in Endoscopic Endonasal Transsphenoidal Surgery with Polyester-Silicone Dural Substitute and Fibrin Glue: Technical Note

Paolo Cappabianca, M.D., Luigi Maria Cavallo, M.D., Giuseppe Mariniello, M.D., Oreste de Divitiis, M.D., Alicia Del Carmen Becerra Romero, M.D., Enrico de Divitiis, M.D.

Department of Neurosurgery (PC, LMC, GM, EDD), Federico II University of Naples, Naples, Italy; Department of Neurosurgery (OdD), University of Messina, Messina, Italy; and Consultorio Medico Integrado (ADCBR), Porto Alegre, Brazil

OBJECTIVE: To describe a simple method of sellar reconstruction after endoscopic endonasal transsphenoidal surgery that will allow rapid watertight closure of the sellar floor.

METHODS: A bent sheet of a polyester-silicone dural substitute, fashioned for this purpose with scissors, is introduced into the sella after removal of the lesion. Because of the consistency of the sheet, it opens spontaneously and becomes stuck. Autologous fat tissue or gelatin foam is positioned thereafter, followed by another layer of the dural substitute; a film of fibrin glue completes the sealing.

RESULTS: Fifteen patients underwent this method and no postoperative cerebrospinal leak or other complication was experienced.

CONCLUSION: This easy method of sellar reconstruction represents an effective and fast possibility to perform the final step of the endoscopic transsphenoidal procedure, which otherwise may cause maneuverability problems in the limited space of one nostril.

(Neurosurgery 49:473–476, 2001)

Key words: Endoscopy, Fibrin sealant, Pituitary adenoma, Transsphenoidal surgery

The endoscopic endonasal approach to the sellar region, recently improved (5) and used routinely in our department since 1997 (1) in more than 140 patients, has demonstrated the great advantages of wide vision "inside the anatomy" of the sellar and parasellar area. At the same time, different technical problems have arisen as compared with the conventional microscopic transsphenoidal approach; with this new technique, the range of vision and action of the surgeon undoubtedly are increased, but the surgeon is obliged to work with an endoscopic skill, which is different from the microscopic skill and requires a long learning curve. Stated differently, if the nasal speculum restricts the surgical target area and compels the surgeon to work with the instruments in a cylindrical-type container and coaxial to it, it also provides the advantage that the two instruments comfortably coexist inside the transsphenoidal retractor. With the endoscopic transsphenoidal technique, on the contrary, the restriction determined by the rigid cylinder is obviated and the working angles increase enormously, with subsequent surgical views unimaginable a few years ago and with even less surgical trauma. The working chamber (i.e., one nostril), however, is narrower, and the surgeon must become acquainted with the use of the instruments, one in each hand, in addition to the endoscope secured to its holder, in a potentially conflicting situation. This explains why dedicated instruments are in development to optimize the procedure (2), help the surgeon to work with easier movements and with more functions in the same instrument (such as suction and curettage), improve the effectiveness of the approach, and shorten the surgical times. Similarly, the resort to simple expedients can simplify the operation in each of its phases.

TECHNIQUE

To perform closure of the sellar floor at the end of the procedure, we refer to the common guidelines of transsphenoidal microsurgery (6), which uses many different materials for this purpose, including cartilage, bone, lyophilized dura, silicon or titanium plates, ceramics, Vicryl mesh, and so forth. In the event a noteworthy intrasellar dead space exists after the removal of a macroadenoma or because of an intraoperative cerebrospinal fluid (CSF) leak, and/or to prevent a CSF leak, it may be necessary to perform an intra- or extradural or a mixed intra-extradural repair of the sellar floor. The endoscopic endonasal unilateral approach to the pituitary area is sometimes so minimally invasive that there is no cartilaginous fragment or bone of the sphenoid sinus

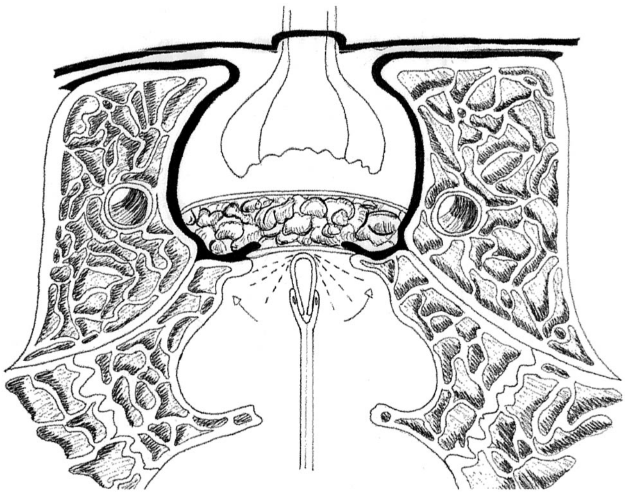

FIGURE 1. Schematic illustration in coronal projection of the sellar region after removal of a pituitary lesion. The tips of the instrument are inside the sphenoid sinus, with the sheet of the dural substitute in its two jaws. Above, the two pieces of the dural substitute already are positioned, with a fragment of abdominal fat between them. The residual gland and the pituitary stalk are situated on this reconstruction. The elastic movement on the release of the dural substitute is depicted.

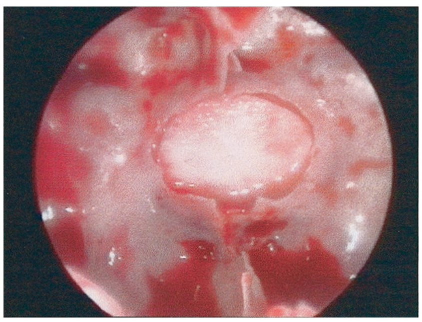

FIGURE 2. Operative image of the dural substitute fitted inside the sella. The clival indentation with a midline septum of the sphenoid sinus is observed below, the planum sphenoidale is above, and the carotid and optic protuberances are visualized laterally.

to be used to close the sellar floor window, or a mucoperiosteal flap of the contralateral nostril from the nasal septum or the middle turbinate is not considered suitable. In such cases, we have used the Patch Biomesh N3 dural substitute (Cousin Biotech, Wervicq-Sud, France), which is a biocompatible but not biodegradable microporous structure made of 100% pure polyethylene terephthalate (polyester) impregnated with dimethyl siloxane (silicone) plus an anti-adherent and sleek face; this can be fashioned with scissors and cut to a size a little larger than that of the bone window. It is flexible, it can be inserted in a bent fashion, and it easily opens in the chosen site because of its elasticity and minimal stiffness (*Fig. 1*). A comfortable maneuver is easily performed in this manner, and thus a watertight seal is achieved without restriction related to the working space, which is not always comfortable. Particularly when a CSF leak has been detected during the operation, we introduce a first layer of the dural substitute intradurally, with the sleek face toward the arachnoid and the porous side facing outside to favor a light reactive fibrosis. We then place an autologous fat tissue fragment or gelatin foam into the sellar cavity, and last another layer of the dural substitute is fitted extradurally (*Fig. 2*). A thin film of Tissucol fibrin glue (Baxter AG, Vienna, Austria) (4, 7) on the external surface of the anterior wall of the sella, in the sphenoid sinus, completes this simple and rapid reconstruction.

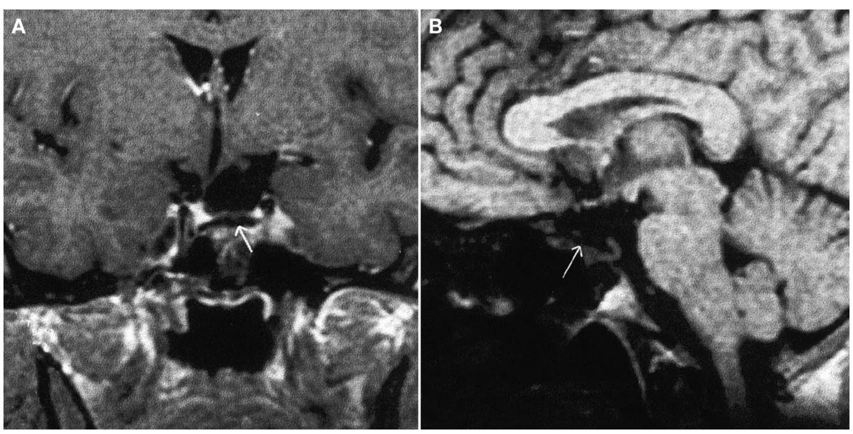

FIGURE 3. Postoperative T1 coronal magnetic resonance images showing a postoperative empty sella after complete removal of the lesion in coronal (*A*) and sagittal (*B*) projection with an absent intensity signal. *Arrows* indicate the layer of dural substitute.

RESULTS

This technique has been used in 15 patients, and contemporaneous use of spinal drainage (3) was necessary in only one patient. For each patient, the postoperative course was uneventful, no infection occurred, and there was no evidence of infection or migration of the dural patch. The postoperative position of the graft can be identified clearly on magnetic resonance imaging scans as an absent intensity signal (*Fig. 3*).

CONCLUSION

An improvement in each phase of the endoscopic endonasal transsphenoidal approach to the sellar region makes this technique rapid and effective in experienced hands. The method presented herein consists of intra-extradural packing by means of two layers of a dural substitute selected for its elasticity and minimal stiffness, with interposed autologous fat or gelatin foam in a sandwich-like fashion, and with an outer additional reinforcement of fibrin glue. This technique can be useful for easy reconstruction of the sellar floor and prevention of some of the complications of transsphenoidal surgery.

ACKNOWLEDGMENTS

The authors received no financial assistance from Cousin Biotech or from Baxter AG for this study and have no remunerative association with these companies.

Received, January 18, 2001.
Accepted, March 29, 2001.
Reprint requests: Paolo Cappabianca, M.D., Department of Neurosurgery, Federico II University, Via S. Pansini 5, 80131 Naples, Italy. Email: cappabia@unina.it

REFERENCES

1. Cappabianca P, Alfieri A, de Divitiis E: Endoscopic endonasal transsphenoidal approach to the sella: Towards Functional Endoscopic Pituitary Surgery (FEPS). **Minim Invasive Neurosurg** 41:66–73, 1998.
2. Cappabianca P, Alfieri A, Thermes S, Buonamassa S, de Divitiis E: Instruments for endoscopic endonasal transsphenoidal surgery. **Neurosurgery** 45:392–396, 1999.
3. Casiano RR, Jassir D: Endoscopic cerebrospinal fluid rhinorrhea repair: Is a lumbar drain necessary? **Otolaryngol Head Neck Surg** 121:745–750, 1999.
4. D'Arrigo C, Landolt AM: Fibrin sealing of mucoperichondrial flaps in endonasal-transsphenoidal pituitary surgery: Technical note. **Neurosurgery** 35:529–532, 1994.
5. Jho HD, Carrau RL, Ko Y: Endoscopic pituitary surgery, in Wilkins RH, Rengachary SS (eds): *Neurosurgical Operative Atlas*: Park Ridge, AANS, 1996, pp 1–2.
6. Spaziante R, de Divitiis E, Cappabianca P: Repair of the sella after transsphenoidal surgery, in Schmidek HH, Sweet WH (eds): *Operative Neurosurgical Techniques, Indications, Methods and Results*: Philadelphia, W.B. Saunders Co., 2000, pp 398–416.
7. Weber R, Keerl R, Draf W, Schick B, Mosler P, Saha A: Management of dural lesions occurring during endonasal sinus surgery. **Arch Otolaryngol Head Neck Surg** 122:732–736, 1996.

COMMENTS

In this technical note, Cappabianca et al. report using a polyester-silicone dural substitute for sellar floor reconstruction after endoscopic endonasal transsphenoidal pituitary surgery. They report using this material in 15 patients, in whom no postoperative cerebrospinal fluid (CSF) leaks occurred. The material was apparently easy to install. The repair was augmented with fibrin glue and either a fat graft or gelatin foam.

I agree that this technique seems easy to use. However, it is impossible to know whether it is superior to simply placing an intrasellar fat graft augmented with gelatin foam and fibrin glue. Its effectiveness in stopping postoperative CSF leaks is difficult to determine from reading this report, because the authors do not tell the reader how many of the 15 patients leaked CSF intraoperatively. If none of the patients leaked CSF intraoperatively, then a CSF leak rate of 0/15 after surgery would be expected. If this were a series of 15 consecutive patients with intraoperative CSF leak, then perhaps a 0/15 CSF leak rate after surgery would be significant.

Another concern is the possible long-term effects of this implant, such as migration or inflammatory changes. No information is provided herein regarding the ease of reoperation if it becomes necessary.

Carl B. Heilman
Boston, Massachusetts

Cappabianca et al. report a surgical technique of sellar reconstruction after endoscopic endonasal transsphenoidal surgery. These authors previously reported on the instrumental modification for endoscopic pituitary surgery. A polyester-silicone sheet is placed inside the sellar cavity. After that step, autogenous fat tissue or gelatin foam is placed into the sella. Another layer of a polyester-silicone sheet is anchored in an inlay fashion at the anterior bony wall of the sella. The last step of the procedure involves the spraying of fibrin glue. The authors achieved successful watertight closure in short-term follow-up.

When microadenomas are removed by endoscopic endonasal transsphenoidal surgery, reconstruction of the sella may not be required. However, the anterior bony wall of the sella is often reconstructed with autogenous bone in my practice. Alternatively, a small piece of titanium mesh is placed if autogenous bone is not available. When a CSF leak is encountered intraoperatively or the tumor resection cavity in the sella is large and the suprasellar tumor dome is descending into the cavity, autogenous abdominal fat tissue is placed into the sella, followed by the placement of autogenous bone or titanium mesh at the anterior wall of the sella. The sphenoidal sinus as well as the normal sinus is kept aerated. If firm reconstruction is required after extensive cranial base surgery, the sphenoidal sinus is packed with autogenous fat tissue in addition to dura and cranial base bone reconstruction. As the authors mention, the placement of autogenous bone or titanium mesh is sometimes cumbersome because of the hard consistency of the graft material. A soft, malleable polyester-silicone sheet is easier to place than hard bone or titanium. Long-term follow-up is required with this technique because delayed pituitary abscess formation has occurred when methylmethacrylate or silicone was placed into the sella. An additional consideration is that the cost of this technique can be significant when two layers of polyester-silicone sheet and commercial fibrin glue are used.

Hae-Dong Jho
Pittsburgh, Pennsylvania

There probably are as many ways to close the sella turcica after pituitary surgery as there are ways of removing a lumbar disc. The authors describe an imaginative, carefully constructed methodology for sellar closure, which is particularly useful in procedures that are performed endoscopically. The method described in this article makes good sense and has been quite successful in its application by this surgical group, which is skilled in the endoscopic technique.

Perhaps a few comments with regard to sellar closure in general are appropriate. It is a little disquieting that many articles that report a series of patients with pituitary lesions operated on endoscopically seem to include recommendations of a routine fat graft for closure of the sella. It is my opinion that the use of tissue grafting is necessary only when an intraoperative CSF leak has occurred. In experienced hands, CSF leak should occur relatively infrequently: it occurs approximately 30% of the time in most series. In patients without CSF leak, some experienced transsphenoidal surgeons do not pack the sella at all. It has been my custom to attempt to obliterate the dead space, and I usually do this by using Gelfoam (Upjohn Co., Kalamazoo, MI) if there has been no leak and by using fat taken from the abdomen if there has been an intraoperative CSF leak. It has not been my custom to use postoperative lumbar CSF drainage in the usual case of intraoperative CSF leak. I do use 48 hours of postoperative lumbar CSF drainage in those patients who have had surgery involving an extended cranial base approach with removal of the tuberculum sellae and part of the planum sphenoidale; but in some 3600 traditional transsphenoidal procedures at my institution, postoperative CSF drainage has been used only a handful of times.

Reconstruction of the floor of the sella is probably important when there has been an intraoperative CSF leak, and the method described herein is an excellent one, particularly when there is no readily available autologous bone or cartilage. A number of artificial materials have been used to fashion the floor of the sella as described here. My colleagues and I have had good success at our institution with MacroPore plates (San Diego, CA) tailored to fit the sellar opening. The use of fibrin glue has not been a routine part of our technique. It certainly is effective in many cases, but its cost-effectiveness may become an issue. The basic principles of the sellar closure are outlined well in this article. They include effective sealing of an intraoperative CSF leak, obliteration of dead space, and anatomic reconstruction of the sella.

Edward R. Laws, Jr.
Charlottesville, Virginia

Triton, moon of Neptune.