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# Extradural Balloon Obliteration of the Empty Sella Report of Three Cases (Intrasellar Balloon Obliteration)

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## Summary

Empty sella syndrome is an anatomical and clinical entity composed of intrasellar reposition of the CSF and compression of the pituitary tissue, resulting in a clinical picture of headache, visual field defect, CSF rhinorrhea and some mild endocrinological disturbances. While some cases are primary with no appreciable aetiology, secondary cases are associated with prior operation or radiotherapy of the region.

In our series, 3 patients with primary empty sella syndrome were treated by the current approach of extradural filling of the sellar cavity. This technique was first described by Guiot and widely accepted thereafter. We used a detachable silicon balloon filled with HEMA or liquid silicone for obliteration of the sellar cavity and obtained clinically satisfactory results without complications. Visual symptoms regressed and headache disappeared. But at long term follow-up all the balloons were found to be deflated. Despite the facility and efficacy of the technique we do not recommend it in the treatment of the empty sella because the filling of the sella is only transient and relapses may occur.

*Keywords:* Transsphenoidal surgery; extradural balloon; empty sella.

## Introduction

The pituitary gland normally occupies nearly the whole sellar cavity. In the empty sella entity, an arachnoidocele filled with CSF enters into the sellar cavity through a deficiency in the diaphragma sella and compresses the pituitary gland and stalk, displacing them to the floor and to the posterior part of the sella [3, 5, 16]. The clinical appearance of this anatomical state was described as "empty sella syndrome" (ESS) which includes headache, endocrine disturbances, visual disturbances and spontaneous CSF fistula [15]. The primary form of this syndrome covers those cases with no preceding operation or radiotherapy and are commonly associated with female sex, obesity and multiparity [6], while other cases constitute secondary empty sella syndrome.

Management must be conservative and symptomatic except those cases with accompanying CSF fistula, visual defects caused by the kinking of the suprasellar visual system and in rare cases intractable headache [3, 7, 8, 11].

The current surgical management aims at filling of the sellar cavity by the transsphenoidal route [3, 5, 11]. We operated on three patients with primary empty sella syndrome by this approach using detachable silicon balloon.

## Case Reports

In our study, we reviewed three patients with empty sella syndrome, all being female and multiparous. They were referred to us by the Department of Ophthalmology because of progressive loss of vision or defects in the visual field. Full endocrinological and neurological evaluation revealed no other abnormality.

We operated on these patients by the sublabial unilateral septal transsphenoidal route [11] and filled the sellar cavity with an extradurally placed detachable silicone balloon (ITC 6–10 mm. California/USA).

### *Case 1*

This is a 56 year old female with 13 deliveries. She complained of headache and loss of visual acuity. A right homonymous upper quadrantic defect was detected on Goldmann perimetry (Fig. 1). Visual acuity was 7/10 in the right eye and 8/10 in the left. MRI disclosed a typical empty sella image with downward displacement of the SVS (Figs. 2, 3). An extradural balloon was transsphenoidally placed and filled with HEMA (Polimeran, Balt Ex. MontMorency, France) (Fig. 4). The postoperative course was uneventful. Her

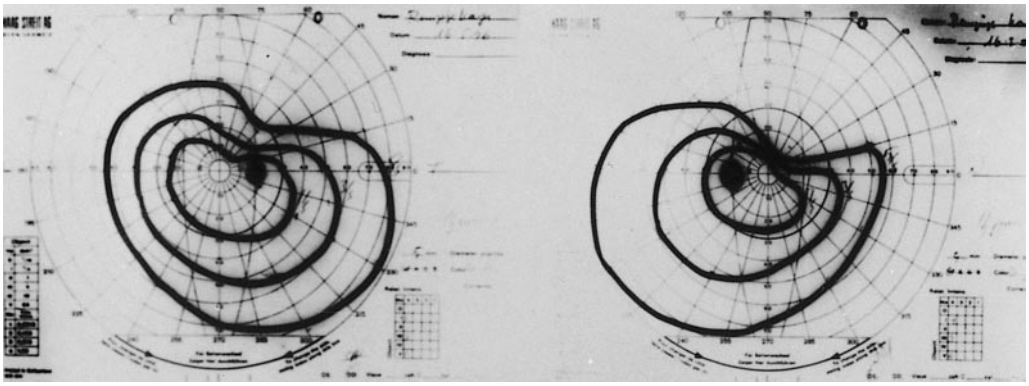

Fig. 1. R. K. First case. Visual field defect of upper quadrantanopsia in preoperative examination

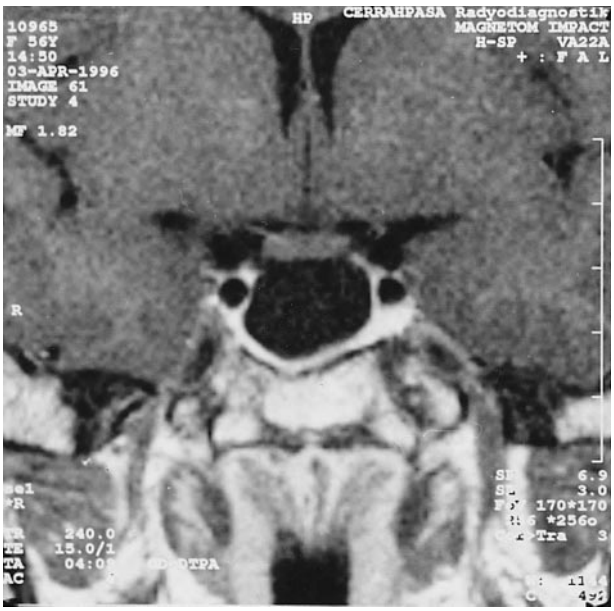


Fig. 2. R. K. Preoperative imaging of the sella with MRI in the coronal plane. İntrasellar region shows the same intensity as CSF

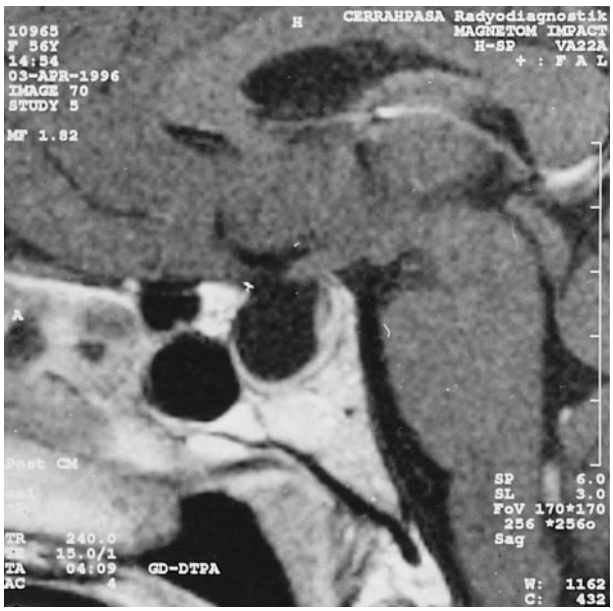


Fig. 3. R. K. Preoperative MRI, sagittal plane. İnfundibulum and hypophysial tissue are displaced and compressed in the posterior part of the sella

headache and visual disturbance regressed soon after the operation (Fig. 5). 2 years after the operation she had mild headache, no defect on Goldmann perimetry. Visual acuity was normal. But an MRI study shows that the balloon is deflated and the basal dura is slightly elevated with remnants of HEMA (Fig. 6).

*Case 2*

This is a 24 year old obese female with 2 deliveries. She had retro-orbital pain, diminished visual acuity on the right eye and loss of libido. Bilateral upper quadrantic defects and enlargement of the blind spot were revealed (Fig. 7). Acuity of vision and endocrinological tests were normal. A typical empty sella was disclosed on MRI (Fig. 8). An extradurally placed balloon was filled with liquid silicone in her operation (Fig. 9). In her follow-up the visual field defect and the retro-orbital pain had disappeared but the enlargement of the blind spot persisted (Fig. 10). 18 months after the operation the ophthalmological control revealed no visual loss. An MRI was a typical empty sella because the balloon had deflated (Fig. 11).

*Case 3*

This is a 51 year old female with 3 deliveries. She had headache and loss of visual acuity. Perimetry revealed bilateral arcuate scotoma (Fig. 12) and the acuity was 8/10 in the right eye and 7/10 in the left. MRI was typical for empty sella (Fig. 13). The patient was operated on by the placement of an intrasellar balloon filled with liquid silicone (Fig. 14). Following the procedure, though the visual acuity of the patient improved, field examination remained unchanged (Fig. 15). 16 months after surgery her visual status was the same but on MRI she had relapse of empty sella because the balloon had deflated (Fig. 16).

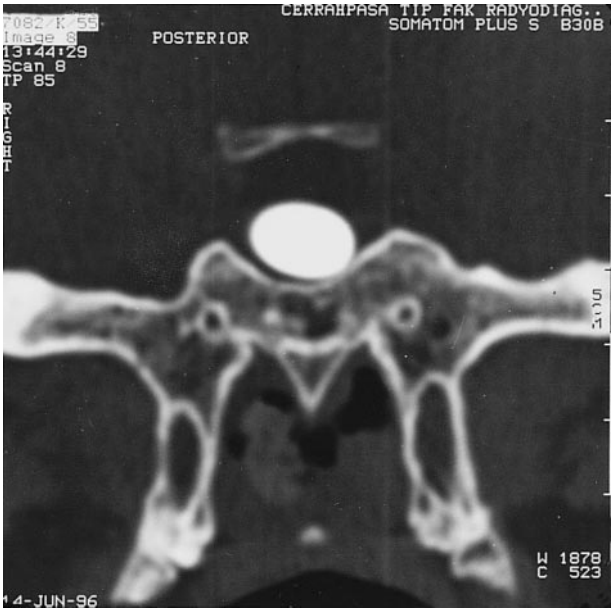


Fig. 4. R. K. Sellar CT on the first postoperative day which shows the intrasellar balloon as hyperdense

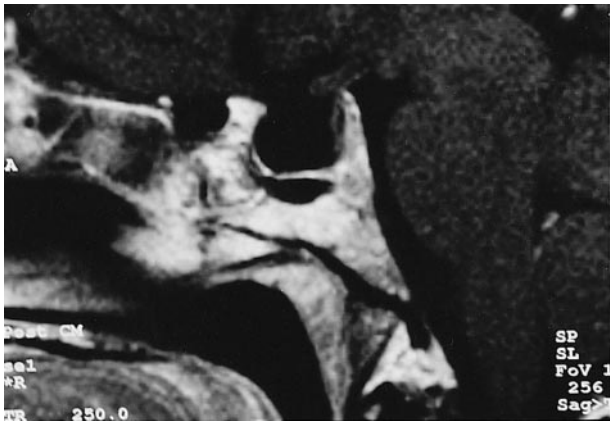


Fig. 6. R. K. Long-term control MRI. Sagittal plane. Note elevation of the dura by hypo-intense HEMA remnants

## Discussion

The diaphragma sella almost completely covers the pituitary body with only a small central opening for the passage of the infundibulum. An incompetent diaphragma sella with herniation of the subarachnoid space was first noted at autopsy studies of Busch in 1951 and he introduced the term "empty sella" [15]. This is a relatively frequent anatomical variant, observed in a ratio of 5.5–36% in various autopsy series and not always of clinical significance [5, 9, 15]. The ESS with associated clinical abnormalities was identified for the first time in 1968 [7, 14]. The most frequent complaint of the patients with this syndrome is headache. Less commonly, visual field defects are noted in the patients owing to the kink of the suprasellar visual system (SVS) [5]. On rare occasions, CSF pulsation of the intrasellar arachnoidocele leads to destruction of the sellar floor and CSF rhinorrhea [8]. Although the pituitary gland is compressed, basal functions are mostly preserved. Disturbances in hypothalamo-hypophysial regulation and hyperprolactinaemia are among the findings of this syndrome in a few cases [2, 6]. While the cases with headache and mild endocrinological disturbances are medically treated for symptomatic relief, those with visual disturbance and rhinorrhea deserve operative treatment [3]. Different pathogenic mechanisms should also be considered in planning the treatment. In primary empty sella syndrome, no underlying pathology is evident in most of the cases [5]. Patients are mostly female, obese, 30 to 40 years of age and multiparous [6]. All our three patients fall into this group; They are female, obese and

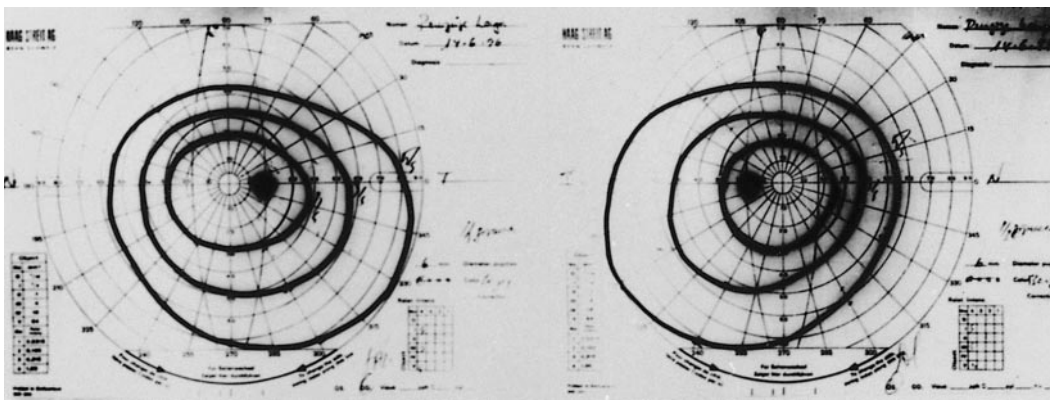

Fig. 5. R. K. Visual field examination on the first postoperative day showing improvement of the defect

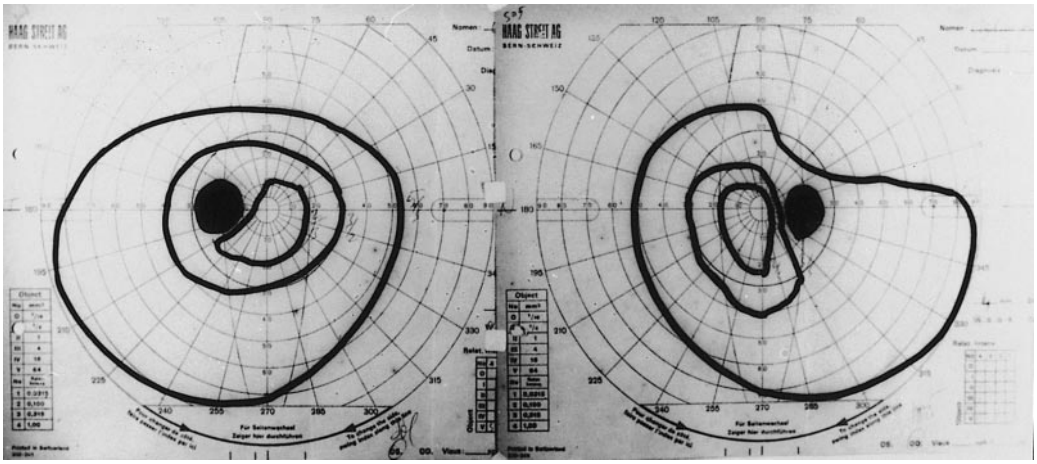

Fig. 7. Ç. G. Second case. Preoperative examination reveals enlargement of the blind spot and upper quadrantanopsia


Fig. 8. Ç. G. Preoperative imaging of the sella with MRI in the sagittal plane which reveals a typical empty sella


Fig. 9. Ç. G. Sellar CT on the first postoperative day which shows the balloon appearing as hyperdense and almost completely filling the sella

multiparous and no concomittant pathology was discovered in their evaluation. In some patients with primary ESS, increased intracranial pressure resulting from hydrocephalus or benign intracranial hypertension act as a promoting factor [2, 13, 17, 20, 22]. Persistance of recessus infundibuli has been sited in the aetiology of some cases [1, 18, 19]. Decreased visual acuity together with papilloedema rather than field defect denotes intracranial hypertension. In addition to kinking of the SVS, increased intracranial pressure leads to descent of the floor of the third ventricle and the initial portion of the anterior cerebral artery with further derangement in visual functions, owing to chiasmal compression and the pulsation of the artery [12, 21]. In those cases the therapeutic approach involves reduction of the increased pressure. MRI of our patients disclosed only a mild displacement of SVS but their examination revealed various defects of the visual fields, possibly as a result of the traction effect of infundibulum over the chiasm.

Transcranial operations were done formerly in secondary cases for the release of adhesions and elevating the herniated optic chiasm (chiasmaspexy). Outcome has generally been disappointing in these operations,

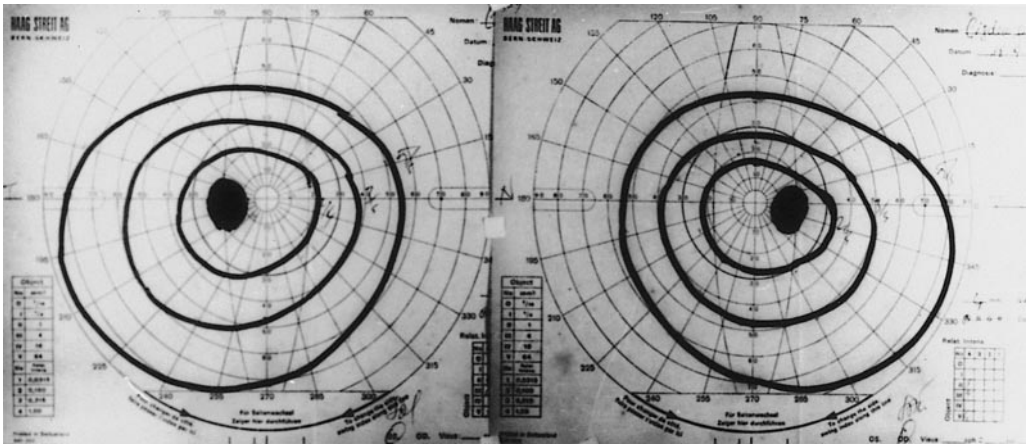

Fig. 10. Ç. G. Postoperative visual field examination showing improvement in the field defect despite remaining enlarged blind spot

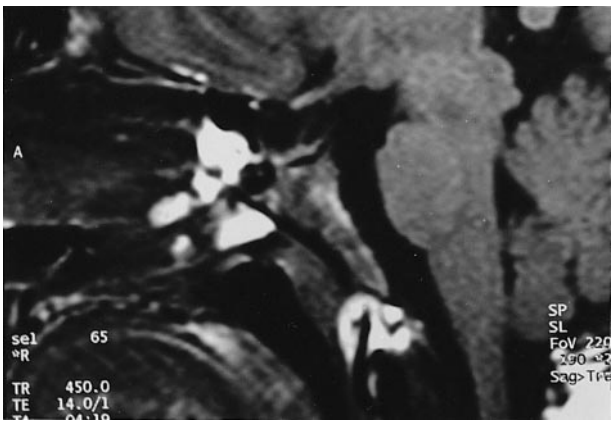


Fig. 11. Ç. G. Long-term control sella MRI, sagittal plane The balloon is deflated

as the visual failure commonly worsened [3, 17, 21]. Mortara and Norell suggested opening of the lamina terminalis to direct CSF pulsation away from the optic chiasm [15]. Recently, filling of the sellar cavity by the transsphenoidal route was introduced as an efficient way of treatment. Considering the high risk of CSF rhinorrhea and infection, Hardy's [10] and Landolt's technique of intradural packaging was replaced by the extradural technique which was suggested by Guiot [5]. This has been widely accepted and put into use as the current treatment modality. The material inserted between the dura and the floor of the sella can be fat or fascia but their tendency to shrink commonly leads to relapses [8, 11]. For the solution of this problem, an enduring material was sought for use and first Nagao,

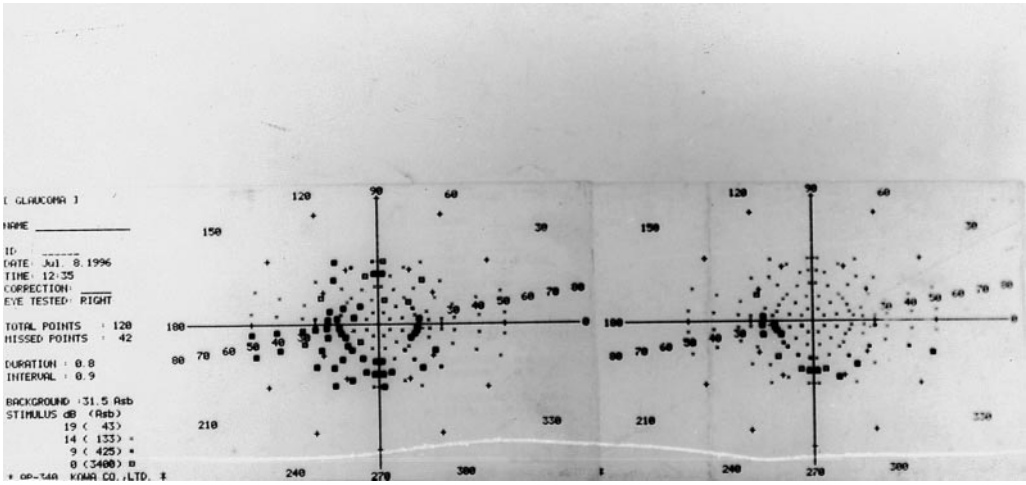


Fig. 12. G. T. Third case. Preoperative visual field examination revealing bilateral arcuate scotoma

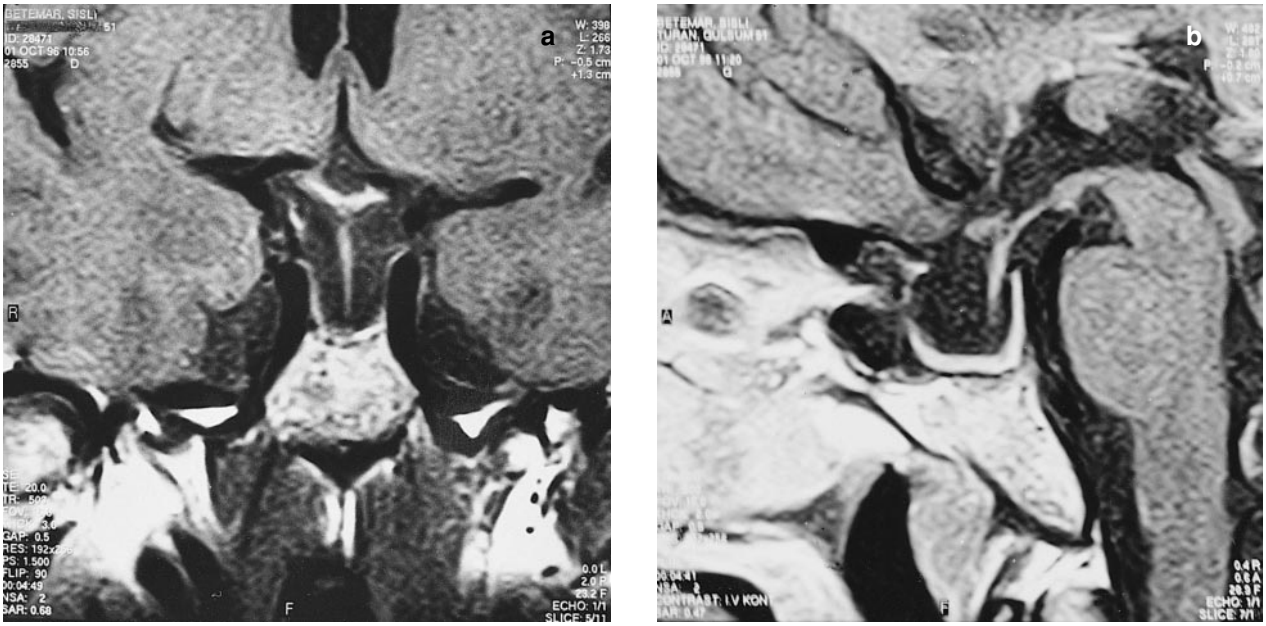


Fig. 13. G. T. Preoperative MRI. (a) Coronal plane. The intrasellar space has the same density as CSF. (b) Sagittal plane. Sella is dilated, the pituitary and infundibulum are displaced and compressed in the posterior part of the sella

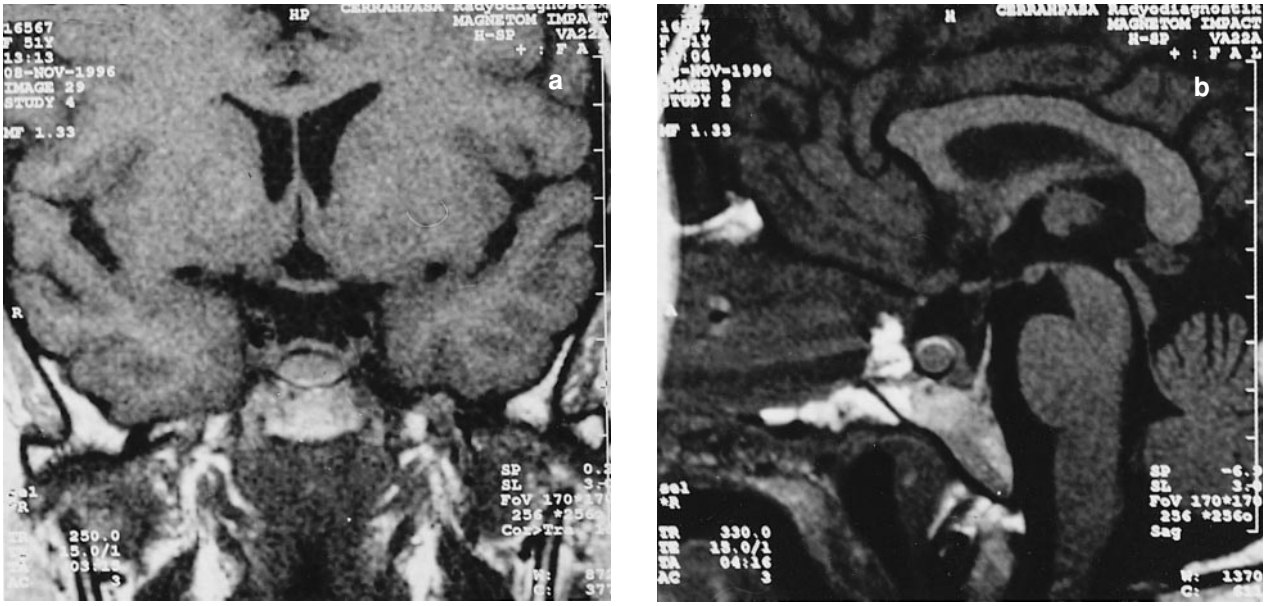


Fig. 14. G. T. Early postoperative sellar MRI shows the balloon which appears iso-intense and elevates the basal dura and pituitary (a) Coronal plane, (b) sagittal plane

then Cybulski used an extradural detachable balloon and HEMA or liquid silicone for the filling of the balloon [4, 16]. They pretended that the obstruction obtained by this technique was not transitory. A 4 mm. opening in the sellar floor is sufficient for the passage of the balloon. This technique was criticised by Landolt who noted that basal dura was continuous with the medial wall of the cavernous sinus, with no clear dissection plan between them; therefore dura could not be elevated sufficiently for the placement of the balloon into the sellar cavity and bleeding from the cavernous sinuses could occur. The sella was completely obli-

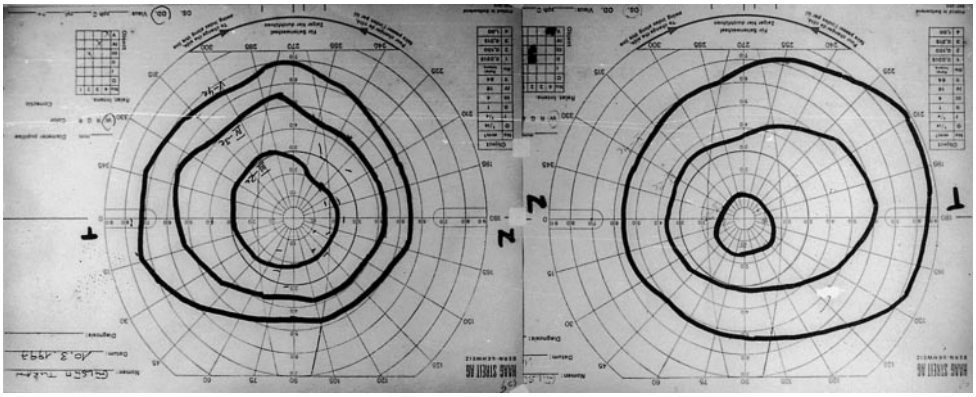

Fig. 15. G. T. Post-operative visual field examination remained unchanged

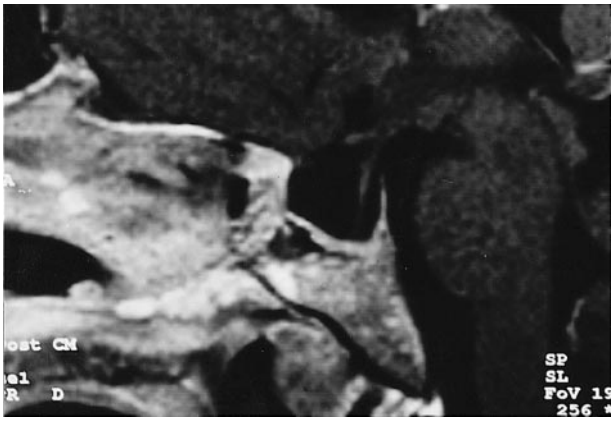


Fig. 16. G. T. Late post-operative MRI. Sagittal plane. Deflation of the balloon associated with the relapse of empty sella is seen

terated in Nagao's case and no bleeding was noted [16]. The sella has been obliterated to a great extent in our three patients as well without haemorrhagic complications. We estimated the sellar volume by preoperative MR scans and selected a balloon of an appropriate size for use. Balloons were placed extradurally and then filled with contrast medium for the peroperative radiological control of sellar obliteration. Then the contrast medium is replaced with the same volume of HEMA or liquid silicone. Since HEMA has not been produced over the last years, it could only be used in the first case and liquid silicone was chosen in the other two cases. This technique has some advantages over others such as a 4 mm. opening is sufficient for the introduction of the balloon and a second incision for the graft is not required; it is easy to apply and a minimally invasive technique. But on long term follow-up results were unsatisfactory because all the balloons had deflated. Despite radiological relapse, clinical symptomatology did not regress. We decided to observe our patients and in case of recurrence we will consider a second operation; this time trying to use a more solid material.

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## Comments

The authors collected three patients with symptomatic "empty sella" syndrome who underwent transsphenoidal surgery using the technique described by Nagao *et al.* about 12 years ago. They used an even smaller access at the sella for the preparation of the dura.

The surgical results with amelioration of visual symptoms in all cases are impressive. But documentation by one additional MRI follow-up and neuroophthalmology findings revealed that the balloons were deflated, despite good ophthalmologic results. This negative experience should be mentioned to the neurosurgical world.

*D. K. Lüdecke*

It is a very well written and well referenced scholarly manuscript which covers a subject of some interest. The authors take a conservative point of view, but mention their interesting experiences with balloon occlusion that will make a very satisfactory contribution to the literature on this subject.

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