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Three-wall decompression technique using transpalpebral and endonasal approach in patients with Graves' ophthalmopathy*

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SUMMARY

Purpose: *To evaluate the effects of the three-wall decompression technique using transpalpebral and endonasal approach in patients suffering from Graves' ophthalmopathy.*

Methods: *In this prospective study, we present a consecutive series of 15 subjects (17 eyes) who were submitted to orbital decompression by removing the inferior and lateral walls using transpalpebral incision combined with a transnasal endoscopic resection of the medial wall. The surgical technique involved the preservation of the bone structure between the lamina papyracea of the ethmoid and the maxillary orbital floor.*

Main results: *The mean ocular recession based on Hertel measurements was 6.00 mm (range, 4-9 mm). None of the patients presented pre-operation diplopia, and one developed post-operation diplopia. Visual acuity was preserved in all cases.*

Conclusion: *It is safe and efficient to perform three-wall decompression, combining transpalpebral and endoscopic transnasal approach, with preservation of the bone structure and the bone lateral to the infraorbital canal with fixation by two titanium plates on the lateral edge and removal of intraorbital fat, which results in significant proptosis reduction and minimal complications.*

Key words: orbital decompression, ophthalmopathy, Graves' disease, endoscopic, proptosis

INTRODUCTION

Basedow-Graves' disease is the most common cause of hyperthyroidism, accounting for approximately 85% of the cases.

Ophthalmopathy may precede or follow the general manifestations of hyperthyroidism. The ophthalmologic manifestations of Graves' disease include eyelid retraction, proptosis, chemosis, diplopia, corneal exposure and optic neuropathy.

Ophthalmologic therapy varies from simple clinical observation to treatment with anti-inflammatory drugs, radiation, immunotherapy and surgery.

Orbital decompression is recommended in cases of optic neuropathy, excessive proptosis, corneal ulceration, secondary glaucoma, incapacitating pain, and also to relieve the side effects of corticoid therapy.

Dollinger (1911) reported the first orbital decompression using Krönlein lateral orbitotomy. Until then, this technique had been used only for orbital tumor removal. Later in 1930, the orbital floor was removed via the maxillary sinus through a transoral approach; this was the first time that an existing space in the paranasal sinuses was used surgically (Hirsch and Urbaneck, 1930). In 1931, Naffzinger removed the orbital roof through a craniotomy. In 1936, ethmoidal cells were successfully removed using an external approach, allowing the orbital content to fill in the vacated space (Sewall, 1936). A combination of the techniques described above was used to perform an orbital decompression removing lower and medial walls through the use of the maxillary approach described by Caldwell-Luc (Walsh and Ogura, 1957).

With the advance of technology, endonasal endoscopic procedures have gained popularity. Kennedy (1990) performed an

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orbital decompression using an endonasal endoscope, removing the medial and lower walls of the socket.

The purpose of this study was to evaluate the improvement in proptosis in patients diagnosed with Graves' disease who underwent a three-wall decompression procedure that combined the transpalpebral and endoscopic transnasal approach with preservation of the bone structure and the bone lateral to the infraorbital canal with fixation by two titanium plates on the lateral edge, and removal of intraorbital fat.

MATERIAL AND METHODS

Patients

In the period from April 2001 to May 2002 fifteen patients with ophthalmopathy were submitted to orbital decompression at the Ophthalmology Department of Escola Paulista de Medicina – UNIFESP, São Paulo, Brazil.

Ten female and 5 male patients ranging from 21 to 72 years old were enrolled in this study. Proptosis was measured using a Hertel exophthalmometer and varied from 24 to 30 mm (mean = 26.64 mm). Seventeen surgical procedures were carried out, 13 patients were operated on one eye only and 2 patients had both eyes operated. Postoperation follow-up varied from 8 to 18 months.

All surgeries were recommended based on the degree of facial disfigurement caused by the disease, except for two patients, one who presented corneal exposure and the other who presented with glaucoma.

All patients were diagnosed with Graves' ophthalmopathy, and received corticoid therapy during the inflammatory stage, and 4 patients received local radiation during this phase. At the time of the surgery, they were in euthyroidism according to clinical evaluation and there were no signs of ophthalmologic inflammation caused by the disease in the 6-month period prior to the surgery.

Patients presented moderate or marked proptosis (24 mm or more) and were included in class 3, 4 and 5 according to the American Thyroid Association classification (Werner, 1977), as measured by the same examiner during the study.

The ophthalmological evaluation consisted of visual acuity, ocular motility and visual field measurements. Pictures and orbital CT on axial and coronal planes were taken for each case.

Patients with abnormalities of the paranasal sinuses, revealed by radiographic studies, were excluded from the study.

Surgical technique

The surgical procedure was performed under general anesthesia, only on one orbit at a time, and decompression was obtained by external incision of tissue and endonasal approaches.

Orbital decompression via the external approach began with a modified blepharoplasty incision in the upper and lower eyelids. Through this incision, intraorbital fat and the lateral and inferior walls were removed, preserving the lateral orbital edge and the bone lateral to the infraorbital canal. Two titanium plates were fixed on the lateral edge.

The endonasal approach and rigid endoscopes were used to remove the medial orbital wall. A sphenoethmoidectomy with middle meatal antrostomy was performed and the frontal recess was opened, as described by Kennedy (1990). The wide opening of the maxillary sinus and the identification of the frontal sinus are of great importance so that prolapse of the intraorbital contents do not obstruct the ventilation and drainage functions of these sinuses.

The medial orbital wall was completely removed and the periorbita was carefully incised from posterior to anterior, avoiding damage to the medialis rectus muscle. In this case, the orbital contents herniated towards the space created by the ethmoidectomy, limited laterally by the middle turbinate. The bone strut between the lamina papyracea of the ethmoid and the maxillary orbital floor was preserved when possible.

RESULTS

Seventeen orbits were decompressed in 15 patients. The bone strut was preserved in 11 patients. Visual acuity did not alter as anticipated because the indicator for decompression was not based on the presence of optic neuropathy. The changes in ocular protrusion, measured by the Hertel method, were determined prior to the operation and 6 months after the surgery. A mean recession of 6.0 mm was observed, ranging from 4 mm to 9 mm (Table 1, Figure 1). None of the patients had preoperative diplopia, and one of them developed diplopia after the operation. Ocular motility disturbance was observed in 6 patients in the primary gaze position before decompression. One patient was normal after the surgery. Three patients experienced new onset of ocular motility disturbances (Table 2). No major intra or postoperation complications were observed and the minor complications occurred are described in Table 3. Post-operation hospitalization did not exceed 4 days in any of the cases.

DISCUSSION

A combined transnasal and transpalpebral approach were used to obtain the best result from each technique with minimal complications.

Endoscopy was used for removal of the medial wall, since this procedure offers direct visualization of the orbital apex, allowing maximum medial orbital decompression (Khan et al., 1995) and fewer complications (Michel et al., 1991; Mann et al., 1994; Lund et al. 1997). To reduce post-operative diplopia the surgical technique involved the preservation of the bone structure between the lamina papyracea of the ethmoid and maxillary orbital floor when possible (Wright et al., 1999) and a balanced orbital decompression (Shepard et al., 1998).

The transpalpebral incision was used to remove the lateral, inferior walls and the intraorbital fat. Decompression involving the ablation of more than a single wall leads to better results in reducing proptosis than a single wall decompression (May et

Table 1. Pre and postoperative hertel exophthalmometer measurements (mm) after orbital decompression.

PATIENT	EYE	PREOPERATIVE (base)	POSTOPERATIVE (base)
DAA	L	26	21
ASR	L	26	18
RZ	L	28	24
JJF	R	27	21
MSS	R/L	27/27	21/21
MC	R	27	23
LGS	R	27	18
FMF	R	24	18
MASS	L	29	22
LT	L	29	22
MP	R	26	21
CGJ	L	25	20
NB	R	27	22
RC	R	30	23
VAO	R/L	24/24	18/18

R-right - L-left

Table 2. Comparison of preoperative and postoperative ocular motility disturbance.

Patient	STRABISMUS PREOPERATIVE	STRABISMUS POSTOPERATIVE
DAA	X(T)15^{o}	X(T)15^{o}
ASR	HTR/L6^{o}	-
RZ	-	-
JJF	-	ET10^{o}
MSS	-	ET8^{o}
MC	-	-
LGS	ET25^{o}	ET25^{o}
FMF	-	-
MASS	-	-
LT	-	-
MP	-	-
CGJ	-	ET10^{o}
NB	XT30^{o}	XT12^{o}
RC	H(T)R/L5^{o}	H(T)R/L5^{o}
VAO	ET25^{o}	ET30^{o}HTD/E10^{o}

HT-hypertropia, H(T)-intermittent hypertropia	XT-exotropia X(T)-intermittent exotropia	ET-esotropia E(T)-intermittent esotropia	R-right L-left

Table 3. Complications after three wall decompression.

COMPLICATIONS	N^{o}
Hematoma	1
Entropion	1
Temporo-mandibulary dysfunction	1

al., 1999). With respect to the intraorbital fat volume reduction, Olivari (1991) found a satisfactory reduction of proptosis with a mean of 5.9 mm. In order to avoid hypoesthesia in the maxillary division of the trigeminal nerve, the lateral bone of the infraorbital canal was preserved. Warren et al. (1989) reported 20% of hypoesthesia immediately after the use of the transoral technique described by Walsh-Ogura.

Titanium miniplates were used to minimize masticatory effects of the temporalis muscle on the ocular globe.

Surgery was bilateral on two patients, and unilateral for the others because eight of them had proptosis less than 24 mm; thus we did not use this technique to avoid possible enophthalmia. Two of the patients presented unilateral proptosis, and two presented within minimal changes during the operation making it impossible to group them in the same cohort.

a b

Figure 1. a) Patient before right orbital decompression; b) Patient after right orbital decompression.

Ünal et al. (2003) performed a three-wall decompression combining transnasal endoscopic approach for the medial wall and an external incision for the lateral and inferior walls obtaining a mean of 6.9 mm reduction of proptosis and observed a 57.1% occurrence of new onset diplopia. In this study we observed only one (6.7%) case of new onset diplopia probably because we preserved the bone structure in the majority of cases (11 patients); in the patient who presented a new onset diplopia the bone structure was damaged. Ulualp et al. (1999) combined a transnasal endoscopic approach for the medial wall and a transconjunctival incision for the lateral and inferior walls with the preservation of the bone structure; there was no development of postoperative diplopia, and the mean reduction of proptosis was 4.0 mm. Probably the smaller reduction in proptosis compared to the one found in our study is due to the difference in the preoperation proptosis or, maybe, another plausible factor could be the absence of the titanium miniplate in the lateral wall.

The experience reported with three-wall decompression is not a new one; however, the procedures by which it was achieved,

with preservation of the bone strut, preservation of the bone lateral to the infraorbital nerve, combining endonasal access helped by endoscopy with transpalpebral access, followed by removal of intraorbital fat and fixation of titanium plates onto the lateral wall without changing the lateral edge of the orbit, have been previously reported.

CONCLUSION

Despite being a highly complex procedure, requiring a significant knowledge of otolaryngology, ophthalmology and plastic surgery, combination of techniques in the three-wall decompression procedure is safe and efficient, leading to significant reduction of proptosis with minimal complications.

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