Surgical Outcome of Transconjunctival Cryosurgical Extraction of Orbital Cavernous Hemangioma

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■ BACKGROUND AND OBJECTIVE: Transconjunctival cryosurgical extraction (TCE) is not an accepted method for the removal of most intraorbital tumors, and thus is not routinely performed. This study evaluates TCE for orbital cavernous hemangioma (OCH), which, due to its specific vascular structure, is suitable for this technique.

■ PATIENTS AND METHODS: In this retrospective case series, the medical charts of 12 consecutive patients with OCH who underwent TCE were reviewed. The operative complications and the surgical outcome were analyzed.

■ RESULTS: Eleven tumors were intraconal and 1 was extraconal. No tumor involved the orbital apex. In 10 patients (83%), the operation was uneventful. One patient lost vision due to intraoperative cilioretinal arterial occlusion. In another patient, the tumor could not be identified and was subsequently removed via lateral orbitotomy.

■ CONCLUSION: TCE, a relatively minor operation, is as safe as more extensive surgical procedures for the removal of OCH not located in the posterior third of the orbital space.


INTRODUCTION

Orbital tumors are most frequently removed via lateral orbitotomy, which allows good access mainly to the lateral and the intraconal orbital space.1–3 Superior orbitotomy through various incisions, which is used for the superior and the medial orbital space, and inferior orbitotomy are performed less frequently.3–5 More extensive operations, such as transfrontal6 or transcranial orbitotomies, are also performed.7 These extensive procedures, some of which involve breaking one of the orbital walls, often allow good surgical exposure of many of these tumors, which at times are not easy to reach.

In 1985, Lazar et al.8 described a far less extensive surgical procedure. In a series of 14 patients (11 of them with orbital cavernous hemangioma [OCH]), intraorbital tumors at various locations were removed transconjunctivally using a cryosurgical technique. Because of their good surgical results, they advocated this surgical approach for the removal of most cases of retrobulbar tumors.

This approach was subsequently severely criti-
and transconjunctival cryosurgical extraction (TCE) is not recommended for routine use. Although the operation has gained some popularity in the United States in recent years, this tendency is not reflected in the literature, and TCE is still considered unacceptable in many parts of the world. We have been using TCE selectively and almost exclusively on OCH due to its unique vascular structure. We report our surgical results and discuss the possibility of using this surgical technique for this specific intraorbital tumor. To our knowledge, this is only the second reported series using TCE for the removal of OCH.

PATIENTS AND METHODS

We retrospectively reviewed the medical charts of all patients with the diagnosis of OCH in whom the tumor was surgically removed from the beginning of 1982 until the end of 1997. Data regarding the clinical presentation, pathologic ocular findings, diagnostic tests, operative reports, postoperative course, and pathologic reports were reviewed.

In all of the patients, an attempt was made to remove the tumor transconjunctivally using the cryosurgical technique described in detail by Lazar et al. Performed under general anesthesia, it involves a 360° peritomy with two conjunctival-relieving incisions and placement of four traction sutures over the rectus muscles. The globe is then displaced in the appropriate direction, based on earlier localization of the tumor by computerized tomography. The tumor is then palpated and exposed after fine dissection of the Tenon's capsule. Using blunt dissection, the anterior surface of the tumor is exposed, and the tumor is then extracted slowly under good visualization using a retinal cryoprobe with simultaneous delicate blunt dissection of the tumor from the surrounding tissues (Figs. 1 and 2).

The exposure of the tumor often seems difficult in the first minutes of the operation when all of the orbital content is tight, but after a few minutes (probably due to softening of the globe and shrinkage of orbital tissues as a result of the surgical manipulations) it loosens up and there is more space for better exposure and better tumor manipulation. Following tumor extraction, an absorbable gelatin sponge (Gelfoam, Upjohn, Kalamazoo, Michigan) is used for hemostasis and the conjunctiva is pulled back and sutured to its normal position.

RESULTS

Twelve patients with OCH (8 men and 4 women) with ages ranging between 20 and 58 years (average 44 years) were identified. Patient data, main findings, and operative complications are summarized in the table. In all of the patients but one (patient 3), the tumor was intraconal and was confined mainly to the middle third of the orbital space. No tumor was located in the orbital apex. All patients presented with a good preoperative visual acuity of 20/40 or better (8 of them with 20/20 vision). All of the patients except one maintained their good preoperative visual acuity postoperatively.

Insignificant mild lid swelling, chemosis, and conjunctival hemorrhage were noted postoperatively in all patients. In 10 patients (83%), the operation and the postoperative course were uneventful. In one patient
(patient 9), the tumor that was in the inferolateral aspect of the intracranial space could not be identified during the operation and it was subsequently removed via lateral orbitotomy. The only major complication of this series occurred in patient 7, who lost vision due to intraoperative cilioretinal artery occlusion, and the reason for this could not be identified.

The tumor was not torn during the cryoextraction in any of the cases, and pathologic examination confirmed the preoperative diagnosis of OCH in all cases.

### DISCUSSION

OCH is the most common vascular tumor of the orbit.\(^3,10\) Surrounded by a fibrous capsule, it is composed of large, dilated vascular spaces lined by flattened endothelial cells and fibrous interstitial tissue, and it does not have a prominent blood supply.\(^11\) This unique structure makes OCH suitable for TCE. The fibrous capsule enables relatively easy surgical dissec-
tion from the surrounding tissues; bleeding following the removal of the tumor is usually minimal and easy to control; the tumor is compressible, and, as such, can be delivered through narrow spaces; and it can withstand a significant amount of traction without being torn.

We have been performing TCE routinely, using the method described by Lazar et al.\(^8\) on all of our patients with OCH on whom we have operated since 1982. We were confident to perform this operation on this particular tumor due to its unique structure and due to our ability to locate it accurately and diagnose

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### TABLE

**Patient Data, Main Findings, and Surgical Complications**

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Sex</th>
<th>Age (yrs)</th>
<th>Location of Tumor</th>
<th>Tumor Size (cm)</th>
<th>Preop Vision</th>
<th>Postop Vision</th>
<th>Operative Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>20</td>
<td>Intracranial superonasal</td>
<td>2.0 × 2.5</td>
<td>20/20</td>
<td>20/20</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>46</td>
<td>Intracranial superotemporal</td>
<td>2.0 × 2.5</td>
<td>20/20</td>
<td>20/20</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>50</td>
<td>Extraconal inferonasal</td>
<td>2.5 × 3.5</td>
<td>20/20</td>
<td>20/20</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>55</td>
<td>Intracranial superonasal</td>
<td>2.0 × 3.0</td>
<td>20/40</td>
<td>20/40</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>42</td>
<td>Intracranial retrobulbar</td>
<td>3.5 × 2.0</td>
<td>20/30</td>
<td>20/30</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>40</td>
<td>Intracranial retrobulbar</td>
<td>2.5 × 2.5</td>
<td>20/20</td>
<td>20/20</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>46</td>
<td>Intracranial retrobulbar</td>
<td>2.0 × 1.5</td>
<td>20/20</td>
<td>HM</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage, cilioretinal artery occlusion</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>44</td>
<td>Intracranial retrobulbar</td>
<td>1.6 × 1.6</td>
<td>20/20</td>
<td>20/20</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>58</td>
<td>Intracranial inferolateral</td>
<td>2.5 × 2.5</td>
<td>20/40</td>
<td>20/40</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>46</td>
<td>Intracranial temporal</td>
<td>1.7 × 1.5</td>
<td>20/20</td>
<td>20/20</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>52</td>
<td>Intracranial inferotemporal</td>
<td>2.1 × 1.8</td>
<td>20/30</td>
<td>20/30</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>49</td>
<td>Intracranial temporal</td>
<td>2.5 × 2.7</td>
<td>20/20</td>
<td>20/20</td>
<td>Lid swelling, chemosis, conjunctival hemorrhage</td>
</tr>
</tbody>
</table>

*Preop = preoperative; Postop = postoperative; HM = hand movements.*
it with certainty preoperatively (combining computerized tomography with magnetic resonance imaging and/or Ultrasound\textsuperscript{12} and Technetium-99m-labeled red blood cell scintigraphy, a method previously described by us\textsuperscript{13,14}). During the operation, the tumor was identified and then slowly extracted from the orbit using a cryoprobe. This extraction was performed under good visualization with simultaneous blunt dissection and gentle separation of the growth from the surrounding orbital structures.

The tumor was removed completely in all cases, leaving no residual parts behind in the orbit (Figs. 1 and 2). Apart from mild lid swelling, chemosis, and conjunctival hemorrhage that were noted in all cases, the operation and the postoperative course were uneventful in 10 of 12 patients (83%). No permanent ptosis, proptosis, or ocular motility problems were encountered in any of the 12 patients. The tumor could not be identified in 1 patient (and was subsequently removed via lateral orbitotomy). All patients but 1 maintained their good preoperative visual acuity of 20/40 or better in all cases (20/20 in 8 of 12 patients). The patient who lost vision during the operation (patient 7) suffered a major intraoperative complication of cilioretinal arterial occlusion that resulted in blindness (hand movement vision) in the eye that was operated on.

In criticism against the routine use of TCE with OCH, Shields et al.\textsuperscript{9} predicted that it was only a matter of time before a major complication (such as the one we encountered in patient 7) occurred. This is because some of these tumors can develop adhesions to vital orbital structures such as blood vessels and nerves. On the other hand, whereas lateral orbitotomy provides a better surgical exposure, even that exposure is often inadequate for a thorough surgical dissection and profound visual loss may occur during that operation as well. Furthermore, if we combine our 12 cases with the 33 cases of OCH removed with TCE by Loewenstein et al.,\textsuperscript{15} there was only one (2.2%) major complication (our case of intraoperative cilioretinal arterial occlusion) in 45 operations. These results compare favorably with the outcome of other more extensive surgical procedures. The only complication that Loewenstein et al. reported was postoperative mydriasis in 4 cases.

Only a few series have been published in recent years reporting the surgical outcome of OCH removal, and the results have been variable. The largest and most comprehensive was a series of 85 cases of OCH reported by McNab and Wright,\textsuperscript{16} in which 71 tumors were removed through lateral orbitotomy, 10 through anterior orbitotomy, and 4 (in the orbital apex) through craniotomy. Three patients suffered total blindness due to intraoperative central retinal arterial occlusion (2 cases) and intraoperative optic nerve damage (1 case). Other relatively minor complications such as ocular motility problems and permanent mydriasis were also reported. Kersten and Kulwin\textsuperscript{17} reported 37 cases of orbital cavernous hemangioma, 35 of which were removed through frontal or lateral orbitotomy and 2 cases through transcranial orbitotomy. Only 1 patient in their series had reduction in visual acuity following the operation and 2 patients had some limitation in ocular movements. Maroon\textsuperscript{18} reported 1 of 75 patients with postoperative visual impairment.

Reviewing the literature, we read with some concern that some neurosurgeons are still using the extensive surgical procedure of transcranial superior orbitotomy for the removal of OCH even when the tumor is not located in the orbital apex or the optic canal,\textsuperscript{7,19} where such an extensive procedure may be indicated. This aggressive approach has been severely criticized by others.\textsuperscript{17,18} Missori et al.\textsuperscript{7} reported a series of 25 patients with OCH where 23 tumors were removed by a transcannial approach. The complication rate of this series was high, as 8 patients (32%) had postoperative reduction in visual acuity and 3 patients (12%) suffered permanent proptosis. It should be noted, however, that many of these tumors were located in the apex and in the medial aspect of the orbit. It seems to us that in the vast majority of cases, transcranial orbitotomy should not be performed because of the increased risks of operative morbidity and ocular complications. Better results were reported by Acciarri et al.\textsuperscript{19} in a series of 13 cases where all tumors were removed through frontal craniotomy. One patient in this series suffered visual deterioration a few months postoperatively, but the precise diagnosis responsible for the visual loss was not reported in the article.

TCE is not suitable for the removal of OCHs that are located in the orbital apex, because it is extremely difficult (if not impossible) to expose the tumor adequately in such a deep location. Furthermore, vital orbital structures (arteries and nerves) are crowded in the orbital apex, increasing the likelihood of a major operative complication. We are of the opinion that TCE should be considered as a surgical option for the removal of OCHs that are not located in the posterior
third of the orbital space. Using TCE for all other locations in the orbit, even for medially located tumors\textsuperscript{15} (which cannot be reached via lateral orbitotomy), may obviate far more extensive procedures such as medial orbitotomy combined with medial orbital decompression.\textsuperscript{20}

In conclusion, looking at the surgical outcome of TCE (the 12 cases reported in our series and the 33 cases of Loewenstein et al.\textsuperscript{13}), the operation compares favorably with the best surgical outcome of other recently reported series using far more extensive surgical procedures for the removal of OCH. This is because of the unique structure of this particular tumor. Because OCH can be diagnosed with almost certainty preoperatively, TCE should be included in one's arsenal of surgical procedures for the removal of this specific tumor when it is not located in the posterior third of the orbital space. We would certainly not recommend that this operation be performed routinely on any other orbital tumors.

REFERENCES