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Orbital Exenteration: Indications and Reconstruction Methods

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Abstract **Original Research Article**

Orbital exenteration is a disfiguring surgery; its major indication is the treatment of extensive orbito-palpebral malignancies. The reconstruction of the residual cavity is a real challenge despite the different reconstruction techniques, especially on weakened terrain. The purpose of this study was to assess and compare the clinical indications and reconstructive methods and outcomes with previously reported data. A retrospective study was conducted on five patients who underwent orbital exenteration surgery. Those cases were collected in the department of plastic, reconstructive and burns surgery at the Al kortobi Hospital in tangier (Morocco) between mars 2021 and June 2022. The main outcome measures were demographics surgery type, clear margins histologically, surgical complications and local recurrence. Five patients were included in this study, 3 men and 2 women with an average age of 75 years old (60 to 90 years old), mean follow up was 5 months. All patients presented with a tumor in the eyelid or periocular skin, diagnosis included basal cell carcinoma in three patients and squamous cell carcinoma in the other two. Total orbital exenteration was performed in all patients, the cavity was filled with a temporalis muscle flap in four cases and with a local flap (type LLL= dufourmental flap) in one case. Clear margins tumor was obtained in all cases and no complications or recurrence were seen so far. Adjuvant radiation therapy was conducted on three cases. Reflecting the literature on the subject, exenteration aims at local control of disease invading the orbit that is potentially fatal or relentlessly progressive. We have promoted reconstruction using the temporal muscle flap thanks to its advantages such as a single operative step thus reducing operative morbidity, good skin coverage, fast healing and fewer postoperative complications. In term of our study, orbital exenteration retains its place in orbito-palpebral cancer surgery, while the temporal muscle flap is the most suitable for post-exenteration reconstruction and good cosmetic rehabilitation can be achieved with a facial prothesis.

Keywords: Orbital exenteration, orbito-palpebral malignancies, lid sparing, reconstruction, rehabilitation.

INTRODUCTION

Orbital exenteration is a disfiguring surgery. It's performed for orbital malignancies in an attempt to achieve cure with tumor free margins. It is also performed in painful or life-threatening orbital inflammations and infections such as mucormycosis. Malignancies of the ocular adnexa are the most prevalent causes of orbital exenteration include squamous cell carcinoma; sebaceous cell carcinoma and basal cell carcinoma other less common tumors include conjunctival malignant melanoma, adenoid cystic carcinoma of the lacrimal gland, and uveal melanoma with extra scleral extension [1, 2]. The first report of an orbital exenteration surgery was a partial exenteration, described by Bartische in 1583 [3].

Golovine is credited with publishing the first report of the modern total exenteration in the early 20th century [4].

Yeatts [5] suggested a classification of orbital exenteration in 3 types: Subtotal orbital exenteration, Total orbital exenteration and Extended orbital exenteration.

Following exenteration, the socket is often left to heal by secondary intention or is covered with a split-thickness skin graft allowing for continued surveillance

for tumor recurrence. Reconstructive surgery with a temporalis flap or a free flap to fill the socket may be utilized in certain settings, for example when adjuvant radiation is planned [6, 7]. The patient must be informed about the nature of the surgical procedure, insisting on its deliberant character, potential complications, cosmetic and cancer control outcome and the necessity of a long-term follow-up [8].

The Main Goals of This Study

- To Point out the indications and surgical techniques of the orbital exenteration.
- To orientate the surgical decision concerning the reconstruction and the rehabilitation.
- To prove the major role of this procedure in local control of the disease.

PATIENTS AND METHODS

This study took place in the department of plastic, reconstructive and burns surgery at the Al kortobi Hospital in tangier, Morocco. It's about a retrospective study including five patients presented with orbito-palpebral malignancies who underwent orbital exenteration, the review period was between mars 2021 and June 2022.

Patient medical records and demographic data recorded included gender, age, personal and family medical history, preoperative imaging, diagnosis, indication for exenteration and previous treatment. The degree of extent of orbital disease and the presence of metastases before surgery were identified from radiology reports while pathology reports allowed us to determine the histological diagnosis and the integrity of surgical margins. The operative report was also utilized to define the type of surgical procedure and reconstruction techniques.

Exenteration was classified as total when all orbital contents including the globe were removed. It was categorized as extended exenteration when excision of adjacent bone was performed and subtotal exenteration if some soft tissue was left in the residual cavity on purpose.

A direct phone call was performed by the author to ascertain survival, searching for complications, recurrences, adjuvant therapy and esthetic results especially the use of eye path, facial prothesis or just wearing tinted sun or eyeglasses.

RESULTS

Five patients were included in this study, there were 3 males and 2 females with a sex ratio of 1, 5. Age ranged from 60 to 90 years, with a mean age at exenteration of 75 years old. Exenteration was performed on the left orbit in four cases and on the right orbit in one case. Mean follow-up period was 5 months.

There may be no signs of orbital invasion in the early stages, although a mass is almost always palpable [9]. In five cases the main symptom was a painless solid mass in the periocular skin, associated or not with an erythema of the adjacent skin mean preoperative visual acuity was 6/10.

Figure 1: clinical aspect of a basal cell carcinoma of the right lower eyelid

Biopsy of the surface tumor is helpful to establish the cell type and to identify perineural invasion [10]. All our patients had a biopsy confirming the malignant nature of the disease and Preoperative diagnosis was basal cell carcinoma in three cases and squamous cell carcinoma in two cases. We should insist that a multidisciplinary team must always be involved to discuss therapeutic possibilities and potential adjuvant therapy if needed.

CT and MRI are useful in assessing the extent of orbital spread. CT is more appropriate for bone destruction; MRI demonstrates the extent of soft tissue invasion and can sometimes detect the integrity of the periorbita [9]. All our patients had CT or MRI before the intervention to evaluate the disease spread.

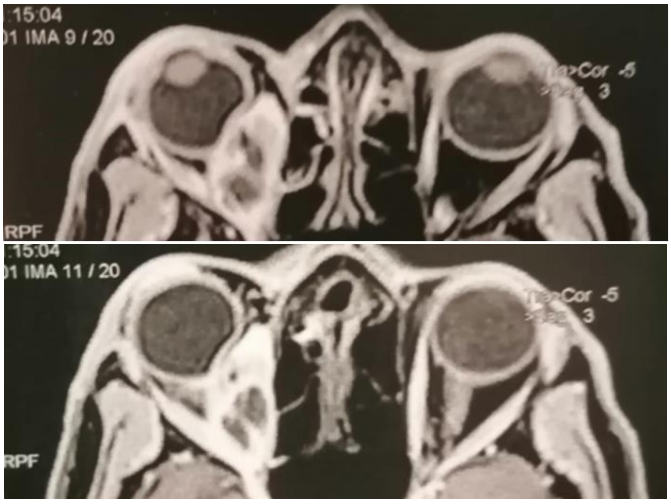

Figure 2: MRI scan of the orbits showing extensive lesion in the anterior medial orbit involving the optic nerve on the right side (a 90 year-old male)

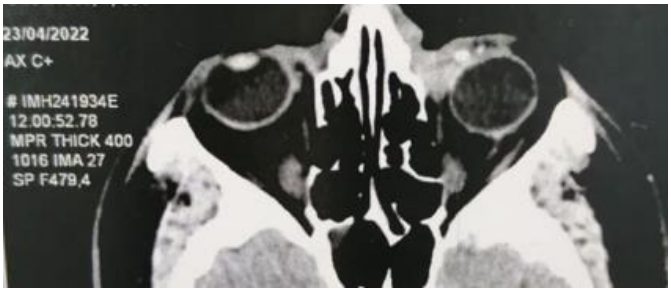

Figure 3: CT scan of orbits. A 75-year-old male showing basal cell carcinoma anterior medial orbit, pushing the globe laterally the patient underwent total exenteration

Exenteration surgery is necessary when orbital and periorbital tumors, and occasionally other conditions, that is potentially fatal or relentlessly cannot be treated more effectively in other ways [13]. About 40-50% of exenterations that present to ophthalmologists are required for tumors originating in the eyelid or periocular skin [14-16]. The relative incidence of periocular skin malignancies varies with geographical area and racial group [17, 18]. Basal cell carcinoma is universally the most common malignant skin tumor accounting for approximately 90% in most series; squamous cell and sebaceous gland carcinoma occur in approximately 4-6% each [13]. In our study, malignant skin tumors were the only indication for orbital exenteration and the upper lid was the most common site in four cases, the lower lid in one case. We should mention that one patient had surgery prior to exenteration, the initial operation consisted of excision of the skin lesions which failed to achieve disease free margins; therefore, he had recurrence of the disease.

The modes of surgical intervention included non-lid sparing total exenteration in four cases, and in one case (60 years old female) underwent extended orbital exenteration for which the periorbital bone was affected. The exposed bone of the exenterated orbit may be treated in a variety of ways; the orbit heals by granulation in 3-4 months [15, 19]. Split skin, with or without meshing, generally heals well [14, 20, 21]. Full-thickness skin grafts should not be used, as the secretions can be profuse and unpleasant [13]. The transposed forehead flap is one of a number of vascularized flaps, which has been described to fill the orbit [22, 23] along with radial forearm free flaps, but temporalis muscle flap is the most common to use in our context.

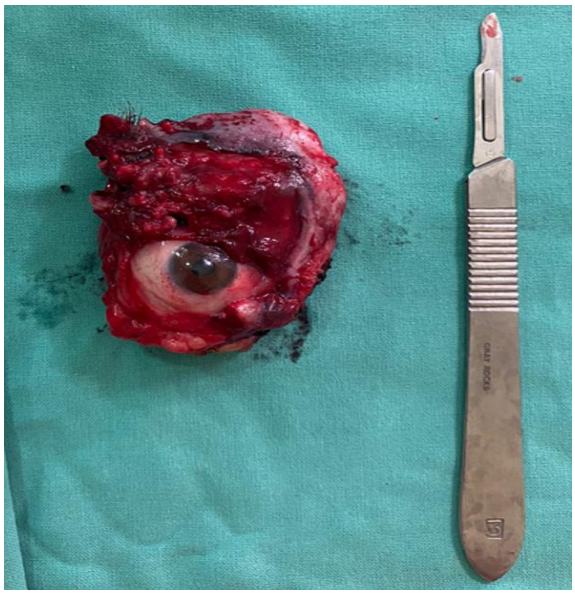

Figure 4: Postoperative image of an orbital exenteration (squamous cell carcinoma)

In our case series, Reconstructive surgery was carried out in all five patients, four of them had temporalis muscle flap and one had a local flap (dufourmental flap=LLL flap) and frequent dressings with antibacterial packs were used weeks after surgery to prevent infection.

Achieving clear surgical margins is not always the rule, however all patients in our study had no positive surgical margins, and three of them underwent postoperative radiotherapy following exenteration as an adjuvant treatment to avoid local recurrence.

Complications can occur very easily if the patient wasn't given careful attention in the postoperative period, these complications include fistula formation into a sinus, the nose or the nasolacrimal duct, tissue necrosis with eschar formation, chronic drainage, infection and pain… [13]. In our study no complication or local recurrence was noted so far.

Figure 5: female patient undergoing extended orbital exenteration, the orbital cavity is to fill with a temporalis muscle flap

After surgery, most patients prefer to wear a patch after exenteration, rather than prosthesis, especially with the larger reconstructions [14, 15, 19, 23]. All patients in our study preferred to wear sunglasses because they couldn't afford ocular prosthesis or eye patch due to their low income.

DISCUSSION

Orbital exenteration is a radical and highly disfiguring operation, which is often a final attempt to cure a life-threatening disease process or to manage local disease in a terminal patient [28].

In our study conducted on five patients, the sex ration was of 1,5 (3 males and 2 females), mean age was about 75 years. In the literature of the last twenty years, the mean age was 64,5 with a masculine predominance 59,2% [24]. The lowest mean age was found in the series of kiratli *et al.,* (39, 4 years) [25] because children who underwent orbital exenteration for retinoblastoma were included in the series. The higher mean age (77 years) was found in the series of karabekmez *et al.,* [26] due to delayed diagnosis mentioned by the authors. The mean follow up was quite short 5 months in comparison to other series like Jeffrey I *et al.,* (9, 7 years) [27] and Guy j *et al.,* (1,2 years) [15]. The main symptom was a small mass in the eyelid or periocular skin with erythema which is similar to other findings from previous data.

Basal cell carcinoma was the most prevalent in our series (3 cases), the same result was found in the series described by Rathbun and associates [1] in which they found 30% of the cases to be basal cell carcinoma, and only 12,5% to be squamous cell carcinoma.

In our case series, all patients were admitted and operated for orbito-palpebral tumors, which perfectly agrees with a number of author's findings including Bartley, levin, and Rahman *et al.,* [29-32]. On the other hand, other series report exenteration performed as a palliative measure for chronic pain secondary to non-malignant disease [33].

Several investigators reported a more conservative surgery with an attempt to minimize deforming effect of the surgery by using eyelid-sparing technique, emphasizing the rapid healing and more acceptable cosmetic results. Shields and associates report that eyelid-sparing technique can be used in most of the cases of malignant tumors and in more than half of the cases originating in the eyelids [19]. In our case series we managed all patients with a total non-eyelid-sparing exenteration, though partial exenteration may allow a better functional and cosmetic result than total exenteration and may lessen the psychological impact of the surgery [15].

One important goal of exenteration surgery is to avoid the extent of malignancy by completely excising diseased tissue and achieving complete clearance of tumors. In our study all patients achieved tumor free margins after surgery; in comparison with some other series such as Simon and al. (68%), Nemet *et al.,* (63%), and Goldberg *et al.,* (62%) [15, 34, 14]. Moreover, Mouriaux *et al.,* [35] report that tumor free margins have little impact on survival in patients undergoing surgery for malignancy, due to the presence of micro-metastases early in disease.

In the literature, the most common reconstruction techniques are muscle flaps (10 to 89% in some series) [28, 36, 37] and skin grafts (12 to 59%) [26, 28, 36, 37]. We have promoted reconstruction using the temporal muscle flap thanks to its advantages

such as a single operative step thus reducing operative morbidity, good skin coverage, fast healing and fewer postoperative complications.

Figure 6: per-operative image showing the preparation of temporalis muscle flap

Figure 7: filling the residual cavity with a temporalis muscle flap

Ben Simon *et al.,* [15] reported complications in 23,5% of 34 exenterations including fistula, infection, tissue necrosis, cerebrospinal fluid leak and chronically exposed bone... However, in our study complications and local recurrence were uncommon perhaps because of the absence of a long term follow up.

The decision to offer adjuvant therapy such as radiotherapy and chemotherapy depends on the judgment of the multidisciplinary team. In our study only three patients received adjuvant therapy after surgery in the form of local radiation.

Despite their cosmetic advantages, a number of authors reported that the majority of their patients refuse to receive an ocular prosthesis and preferred to wear an eye patch, In our study, given the high cost of those devices and the fact that all our patients are coming from a deprivileged social class, wearing sun glasses was the most suitable alternative for them, this constitutes a major challenge for a convenient rehabilitation to ensure social reintegration and a good quality of life. Therefore, developing facial prosthesis and implants in the next years is highly recommended.

Figure 8: 3 weeks post-exenteration surgery, 65 year-old female who underwent total orbital exenteration with a temporal flap

The limitations of this study include its retrospective design and small number of patients undergoing exenteration, therefore a limited data prevent us to assess the efficiency of orbital exenteration in control of the disease with a high survival rate versus the conservative surgery that have been developed in recent years and also to conclude which reconstruction technique is better for good cosmetic rehabilitation.

CONCLUSION

Orbital exenteration may be efficient in term of controlling locally spreading orbito-palpebral tumors. Obtaining clear margins in the ultimate aim of this surgery. In cases of tumor positive margins, other treatment modalities like radio or chemotherapy could be necessary to further extend the patient's survival.

Reconstruction of the residual cavity is a big challenge in our context but may be associated with good cosmetic and functional outcomes. It's more likely to be successful in cases of subtotal exenteration. The absence of complications after surgery such as infection and fistula with good rehabilitation is considered as the best functional and cosmetic results we can achieve. We recommend total exenteration in cases when the disease is invasive and spreading to the orbit and when free tumor margins can't be obtained by subtotal exenteration. However, a randomized prospective study is needed to determine the role of subtotal exenteration compared with total or extended surgery.

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