Original Article

Application of Flap in Repairing Defect of Orbital Tumor

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ABSTRACT

Introduction: Orbital tumors can extensively damage the upper and lower eyelid, peri-orbital skin, peri-orbital peri-bulbar tissue and eyeball. The complete removal of the tumor and the tissue destroyed by the tumor often leaves a large tissue defect area. Therefore, the application of flap in repairing defect after exenteration of orbital tumor is of paramount importance. The objective of this study is to investigate the clinical value of skin flap in repairing defect after exenteration of orbital tumor.

Methods: From January 2008 to December 2017, there were 101 patients with orbital tumors, including 47 malignant and 54 benign tumors. All patients underwent excision of tumor while skin flap was used to repair tissue defects of different degrees. Postoperative observation showed the survival and functional recovery of tissue flap.

Results: The skin flaps of the patients were completely alive after operation, the defect was completely closed, and the flaps were viable as of color of the flaps. Quality of life score significantly improved after flap surgery.

Conclusion: The flap is used to repair the skin defect after orbital tumor surgery, which is helpful to improve the quality of life of patients with orbital tumor.

Keywords: application, flap, orbital tumor.

Introduction

An orbital tumor is a mass formed by the excessive proliferation of mutant cells in the orbital region. The anatomic sites can be divided into intra-orbital tumors, orbital wall tumors and intruding intra-orbital adjacent tumors, including primary and secondary orbital tumors.[1] Surgical resection of the tumor is still the mainstay of treatment. Orbital tumor is easy to invade the skin, muscle tissue and bone of maxillary sinus, so it needs extensive resection. This most of the time creates a large defect after resection, even exposing the bony structures. Repairing these huge defects is a challenge to clinicians. The clinical data of 101 patients with ocular/orbital tumor treated in the Affiliated Hospital of Chengde Medical University and Southern Medical University Affiliated Fengxian Hospital in the past 15 years are retrospectively analyzed to see the results different flap reconstructions.

Methods

Study design and settings: From January 2008 to December 2017, 101 patients who underwent intra-orbital tumor resection were selected from the ophthalmology department of the Affiliated Hospital of Chengde Medical University and Southern Medical University Affiliated Fengxian Hospital.

Inclusion criteria: 1. Intra-orbital space-occupying lesions were diagnosed by color doppler ultrasound, CT and MRI examination before surgery, and intra-orbital tumors were confirmed by pathological examination after surgery. 2. Age was 18 years

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or above with complete clinical and pathological data.3. The patients and their families had the same understanding and agreement on this study, and approved by the hospital ethical committee.

Exclusion criteria: 1. Patients with glaucoma, cataract and other eye diseases. 2. Patients with other primary malignant tumors.

Results

Among the 101 patients with orbital tumor, there were 49 male patients and 52 female patients, with a gender ratio of 0.94:1. There were 53 cases of left eye surgery, 46 cases of right eye surgery, and 2 cases of bi-ocular surgery. The patients were between 18 and 85 years old, with an average age of (42.29±18.25) years. The disease course was 3 months to 26 years, and the average disease course was (7.84±3.41) years. Among them, 47 were malignant tumors, including 12 cases of adenoid cystic carcinoma, 10 cases of malignant melanoma, 8 cases of squamous cell carcinoma, 11 cases of basal cell carcinoma, 3 cases of sebaceous adenocarcinoma, 1 case of optic astroglioma, 1 case of malignant schwannoma, and 1 case of poorly differentiated spindle cell carcinoma. There were 54 cases of benign tumors, including 10 cases of hemangioma, 12 cases of meningioma, 11 cases of optic glioma, 6 cases of neurofibroma, 11 cases of dermoid cyst, 2 cases of pleomorphic adenoma of lacrimal gland, and 2 cases of epidermoid cyst, as shown in table l. There was no statistically significant difference in the proportion of malignant and benign tumors (χ^2=1.950, p=0.163).

Table 1: Classification and basic information of orbital tumors

Type	Gender (n)		Age in years	Number of cases (n)
	Male	Female		
Malignant Tumor				
Adenoid cystic carcinoma	5	7	40-85	12
Malignant melanoma	6	4	35-70	10
Squamous cell carcinoma	5	3	4-75	8
Basal cell carcinoma	5	6	50-70	11
Sebaceous adenocarcinoma	1	2	34-76	3
Optic astroglioma	1	0	43	1
Malignant schwannoma	0	1	35	1
Poorly differentiated spindle cell carcinoma	1	0	56	1
Benign Tumor				
Hemangioma	5	5	18-50	10
Meningioma	5	7	37-76	12
Optic glioma	6	5	19-35	11
Neurofibroma	2	4	54-65	6
Dermoid cyst	5	6	18-32	11
Pleomorphic adenoma of lacrimal gland	1	1	25-54	2
Epidermoid cyst	1	1	18-24	2
Total	**49**	**52**		**101**

All patients in this group underwent surgical resection. Before surgery, the size of the tumor was accurately measured to estimate the degree, size and shape of skin tissue defect. The distance of normal margin of skin from the tumor ranged from 0.5 cm~0. 8 cm. Adequate depth of the tumor was removed and surface was routinely confirmed negative by frozen section biopsy. The defect area after tumor resection ranged form was 5 cm×5 cm ~ 8 cm×9 cm. For the defect after surgical resection, different methods of flap repair were adopted according to the size of the defect. The measurement of size of tissue defect was done with use of line mark in 2 dimensions and size and shape of the planned transfer flap. The flap was raised with injection of normal saline with adrenalin in the area of prospective flap. The measured flap was taken usually from temporal and naso-labial area with definite arterial feeding in direct rotation or in

subcutaneous fashion. Some patients in the later part of study received free flaps with vascular anastomosis. These were sutures in layered continuous suture. Closed suction drain was applied in the wound. According to the pathological results of the tumor, the Radiotherapy and or chemotherapy was given to the patients.

Comparison of flap application

The proportion of rotational flap and free flap in malignant tumor group and benign tumor group was compared, and the difference was not statistically significant (p>0.05), as shown in table 2.

Table 2: The proportion of rotational flap and free flap in malignant tumor group and benign tumor group was compared

Flap type	Malignant tumor	Benign tumor
Local skin flap	25	28
Free flap	22	26
χ^2	0.769	0.297
p-value	0.380	0.586

Postoperative flap condition

All the flaps survived after surgery, the defect was completely closed, and the color and surface temperature of the skin flaps were close to surrounding skin. The pain of the disease disappeared after operation. The patient was satisfied and discharged from hospital smoothly. Follow-up for half a year showed no signs of tumor recurrence or flap dehiscence.

Comparison of patients' quality of life

The quality of life score of patients after surgery was significantly improved compared with that before surgery, and the difference was statistically significant (P<0.05), as shown in table 3.

Table 3: Quality of life scores were compared preoperative and postoperative

Type of tumor	Number of cases	Preopera-tive	Postoper-ative	t	p-value
Malignant	47	31.81±1.48	42.26±1.51	-41.407	0.000
Benign	54	36.94±1.31	44.46±1.67	-35.458	0.001

Discussion

Reported recurrence and survival rates for patients who have undergone exenteration of orbital tumors are variable. Bartley et al.[2] reported on 19 different types of neoplasms in 102 patients. Squamous cell carcinoma, basal cell carcinoma, and melanoma accounted for 70% of the neoplasms. In 82 patients with no known residual tumor or metastases after surgery, the 1-year survival rate was 88.6%, and the 5-year survival rate was 56.8%. The 5-year rate of free of recurrence or metastases survival was 48.3%.

The methods used to repair orbital tumor defects must be safe and reliable, and the ideal repair operation should not prolong the length hospital stay of patients, increase the occurrence of complications, and not affect the further treatment of patients. Although there are many methods to repair the defect after orbital tumor resection, free tissue flap is the most commonly used method for the larger defect in present day. A variety of types of flaps and grafts can be used for reconstruction following exenteration.[3-8] The large size of the orbital exenteration defect, dural exposure, exposure of paranasal sinuses in addition to the orbital exenteration cavity, and the need for adjuvant postoperative high-dose radiation therapy dictate the use of large vascularized free flaps in some cases.[4-5] If an orbital prosthesis is desired, a skin graft or fascio-cutaneous flap may be placed, leaving an "open" cavity with a concave orbital socket. Placement of bulkier myocutaneous flaps results in a "closed" cavity.[8]

The flap repair should have the following advantages: 1. The color and texture of the flap are similar to the tissue in the repaired area. 2. The flap can be cut with large area, good skin texture and moderate thickness, and can repair the wound of large area soft tissue defect. In general, the length of the pedicle flap of subcutaneous tissue is 1.5 ~ 2.0 times of the width, and the donor area is directly pulled and sutured with subcutaneous tissues [9] 3. The flap which is well vascularized is obviously better in anti-infection ability. 4. The anatomical position of the blood vessels supplying the flap is relatively constant and the vessel is with reasonably good caliber, makes the operation consistent in results. When there is abberations, preoperative color ultrasound examination can mark the blood vessels successfully during the operation. 5. The island flap has a long enough pedicle. 6. Adjacent repair area makes tissue transfer easy. 7. The donor area is relatively concealed and can be directly closed and stitched, which has little impact on the appearance and is an ideal flap for repairing orbital tumor defects. These advantages have broad application prospects in the repair of orbital tumor defects.

The position of the supplying blood vessel of the flap was determined by the hand-held color doppler flow detector before and during the operation. The position of the flap was labeled on the skin, so as to keep the position of the patient before operation consistent with that of the operation, so as to prevent the position

of the vessel pedicle from changing due to the change of the position during operation. The flap should be dissected and prepared with gentle maneuvers, and the subcutaneous tissue and muscle of the musculocutaneous flap should be temporarily sutured and fixed, and the muscles on both sides the flap has to be properly homeostatic to prevent hematoma.

Flap observation: the purpose of flap monitoring after operation is to detect the signs of damaged of flap perfusion. At present, the most commonly used method is still the clinical observation of the flap, including the color, texture, temperature, filling and swelling of the flap. Vascular crisis of skin flap usually occurs within 72 hours after operation and is more likely to occur within 24 hours, which can be sudden or gradually formed. Therefore, the blood supply of the flap was observed and recorded every hour after operation. The judgment criteria were: pink white was normal, pale color was arterial spasm, and purple color was venous congestion. Main observation methods: 1. capillary filling test: pressure with the finger flap, skin color pale, remove the finger after 2 ~ 3 seconds, flap from pale to rosy, indicating normal capillary filling test. 2. needle bleeding test: if vascular crisis is suspected in the flap, 24 or smaller gauge needle can be used to pierce 5 mm into the skin flap, pull out and gently squeeze the surrounding tissue, if there is bright red blood slowly overflowing, it indicates normal. If there are purple spots on the skin flap, it gradually turns dark purple or the skin flap augmentation becomes dark, and gradually changes from dark red to purplish-red or purplish-black, the skin flap swelling gradually becomes increased in size, loses elasticity, the texture becomes hard, the capillary filling slows down (increases quickly in the early stage), and the prick on skin flap has dark red exudation, which can be judged as venous crisis of the skin flap. Once the flap is found to be in vascular crisis, immediate surgical exploration is an important factor to rescue the flap.

The application of flap in repairing orbital tumor defect is effective and feasible by clinical observation and improves the quality of life of the patients. However, for patients with visual function, how to form upper and lower eyelid with function or partial function after the flap repair, without exposing the eyeball is the difficult functional surgery on evolution. Multidisciplinary management and rigorous planning allows adequate surgical access, appropriate management of pathology, reduces complications, and improves long-term outcomes.[10] Head and neck radiologists, orbital and plastic surgeons, and orbital oncologists who care for patients following orbital exenteration should be aware of the wide range of clinical and imaging presentations of post-exenteration tumor recurrence because failure to detect the recurrence early may lead to delay of appropriate treatment. Regular surveillance using imaging studies to entail every 3 to 4 months of imaging during the first 2 years of follow up and less frequently afterward.

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