

The Role of Using Motorized Diamond Burr Polisher Instrument in Minimizing the Recurrent Rate of Pterygium Excision

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ABSTRACT

To compare the effects of using motorized diamond burr polisher in pterygium excision versus manual polishing of the corneoscleral bed in reducing the recurrent rate. A prospective, comparative and interventional study of 90 consecutive patients with different grades of primary pterygium, who underwent pterygium excision at Shahid Aso teaching eye hospital in Sulaimani city, between August 2018 till September 2019, which was performed by single surgeon. In group A (45) eyes polishing of the corneoscleral bed done using motorized diamond polishing burr, and in group B (45) eyes using manual crescent blade for polishing. Recurrent rate was evaluated after about (8±2) months postoperatively. Ethical consideration of the risks and the benefits of the procedure was observed for each individual patient. A 90 patients with the mean age of group A (48.84±12.7) years and group B (49.67±12.3) years, complained of different grades of primary pterygium, group A had 31(68.9%) male and 14(31.1%) female, while group B had 22(48.9%) male and 23(51.1%) female. Each individual factors like age, gender, visual acuity, BCVA pre and postoperatively, IOP measurement, dryness of the eye and risk factors like smoking and UV exposure affecting the recurrence were assessed. In both groups the main indication for surgery was sign of irritation. The mean surgical time was calculated and the difference between two groups were significant. After follow-up of average six months the outcomes and recurrent rate were checked, recurrent rate was in group A 1(2.2%) while in group B was 6(13.3%) patients. it significantly decreased. Corneal scar happens in only 1(2.2%) case of group A while in 11(24.4%) cases in group B, Corneal scar was statistically significant. In both groups the change of BCVA was significant but the visual change was more significant in group A in compare to group B. Motorized diamond burr is a safe instrument for polishing the cornea during pterygium excision, it is easy to handle, low price, need lesser operative time, its effect on recurrence postoperatively is significant and beside it leaves lesser corneal scar and early visual recovery postoperatively.

1. INTRODUCTION

A pterygium (from Greek, pterygos, “little wing”) [1], clinically it is a wing like fibrovascular growth originating from the bulbar conjunctiva invading the superficial cornea [2], histologically the head of the conjunctival epithelium consists of hyperproliferative vessels while the body is degenerated connective tissue, which show elastotic degeneration [3]. So the invasion and destruction of corneal stroma and Bowman’s membrane by degenerated fibrovascular tissue arising from subconjunctival tissue is the proses of pterygium formation [4].

Pterygium mainly found in areas with high ultraviolet radiation, and also dry, hot, dusty, windy, and smoky environments are other cause of it. Nasal side more commonly affected than temporal side and even bilateral (kissing) pterygia can be noticed [5]. Sign of chronicity of pterygium is iron deposition in the basal layer of corneal epithelium which called Stocker’s line. Despite the variety of treatment, the surgical removal is the most effective one [6,7]. Surgery is indicated when visual acuity is affected due to irregular astigmatism, threatening of visual axis, recurring irritation, chronic inflammation, diplopia due to motility disorders and cosmetic reasons [6,8]. Preventing the commonest complication of pterygium surgery which is the recurrence is the golden goal of it, and this can be achieved by restoration of limbal anatomy which can be enhanced by smoothing of the corneoscleral bed that in turn help in faster reepithelialization and this prevent the pterygium to have the chance of recurrence [9]. Following the removal of pterygium corneoscleral bed is polished to remove any attached remnants of the tissue and to smoothen the irregular surface, and this is usually done differently by the surgeons using a crescent blade [10], motorized diamond burr [11], Westcott scissors [12], iris spatula [13], or No. 64 Beaver blade [14].



Figure 1: Diamond burr

Since the early 1960s number of surgical techniques have being found [15], including the bare sclera technique, simple closure with absorbable sutures, sliding flap, rotational conjunctival flap, mucous membrane graft, and conjunctival autograft and amniotic membrane grafting. For preventing the recurrence other therapies are added to a number of these techniques like using strontium-90 and mitomycin C or fluorouracil as an antimetabolite [16].

Risk factors for the recurrence are geographic location, age, gender, morphology and grade of pterygium, and the type of surgical technique. [16,17]

Most of the recurrences take place within first 6 months postoperatively, and it has been attributed to the upregulation of the inflammatory process. [16,17]

Kenyon *et al* described conjunctival autograft in 1985 for the first time. *The* proses is to apply a free piece of conjunctiva that has been taken from nearby side to the bare sclera where the pterygium is removed. [18]

Since the procedure is associated with lower recurrence rates it is considered to be the most effective method for pterygium treatment.

2. METHODS AND MATERIALS

This prospective, comparative and interventional study comprised of (90) eyes of (90) patients undergoing pterygium surgery at Shahid Aso Teaching Eye Hospital in Sulaimani city, Iraq, between August 2018 till September 2019. Patients including in the study between age (25-74) years having primary pterygium involving any eye. Ethical consideration regulated by ministry of health was observed during operation and research, informed consent after clarification of the procedure and its outcome and risks was taken from the patients.

The surgical procedure was performed in the same fashion by the same surgeon. Thorough history was taken and documented at the time, eyes with any pathology which would affect wound healing were not included in the study such as ocular trauma within the past 6 months, active infection and inflammation, severe dry eye, allergic disease and systemic disease such as autoimmune disease, bleeding tendency also were excluded. Each individual factors like age, gender, associated eye disease like cataract and refractive error were documented. Risk factors like excessive sun exposure, smoking, dry environment preoperatively and post operatively which affect the recurrence were considered.

Indications for the surgery were classified as followed; sign of irritation, blurring of vision, cosmetics, difficulty in intraocular lens measurement for patients who have cataract by the pterygium, and obscuring the visual axis by the pterygium. Preoperative assessment included visual acuity, refraction, best corrected visual acuity (BCVA), measuring intraocular pressure (IOP) using air puff tonometer, slit-lamp biomicroscopy for examining the anterior chamber and fundus examination. Grading of the pterygium was done using R.M. Youngson system which means invasion of $<1.5\text{mm}$ of cornea regarded as grade I and more $>1.5\text{mm}$ is grade II, if more than half of radius of cornea is invaded by pterygium regarded as grade III, and finally grade IV is means that even the center of the cornea is invaded.

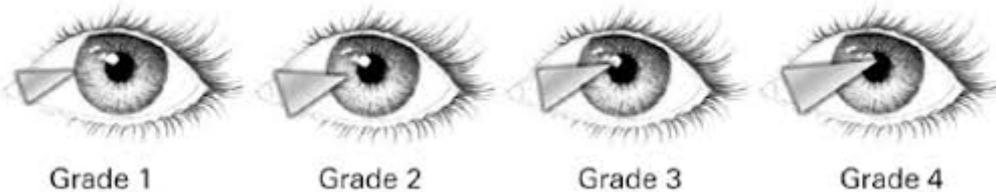


Figure 2: Grading of pterygium using R.M. Youngson system

A (90) patients with primary nasal pterygium underwent operation by excision of pterygium followed by conjunctival autograft that fixed in place by suturing with 10.0 nylon suture. The patients divided into two groups, (45) patients were regarded as group (A) motorized diamond burr (Alger brush II) used for polishing of the corneal bed, and the other (45) patients as group (B) crescent blade manual polishing was used.

Surgical technique

The same surgeon did all the surgeries using the same technique. The procedure was carried out under topical and local anesthesia, Proparacain (0.5%) eye drops were used for 5 min in each case, subconjunctival HCL lidocaine (2%) was injected into the pterygium by a25-gauge needle after applying speculum to expose surgical area. Minimal area of the pterygium was outlined and bluntly dissected from the underlying sclera then the body was excised by using Westcott scissors, followed by excision of the pterygium head by careful dissection of the head from the surface of the cornea using toothed forceps to lift the head and crescent knife to excise the head from peripherally until the limbus. Tenon's capsule removed so that the conjunctival autograft can be applied on to the sclera, the procedure done carefully not to damage the medial rectus muscle. The remnant tissue after excision of the head and body of the pterygium on the surface of the cornea require to be cleaned and smoothed that aids in reepithelization and healing.

According to the polisher used in this study dividing of the patients is done into group (A) and group(B). In group (A) Motorized diamond burr (Algerbrush II) used, this instrument composed of (2.5mm fine grit round diamond burr with cap, handpiece, AA battery and chuck). Precise polishing and perfect smoothing of the surface can be done by using this instrument, to avoid burning of the cornea and providing evenly removal of the tissue, the burr is moved in circular motions with continues surface irrigation.



Figure 3: Alger brush II MDB

In group (B) Crescent blade used gently to scrape the remnant tissue. Excessively bleeding vessels were cauterized. Surgical caliper was used to measure the defect of the conjunctiva, the same size of limbalconjunctival autograft was taken from the same eye (superotemporal quadrant) after injection of xylocaine to subconjunctival tissue, the resected graft oriented limbus-to-limbus and put in place and sutured by 10–0 nylon sutures in simple interrupted fashion. Thereafter, gently removed the speculum and the eye was dressed for 24 h using chloramphenicol eye ointment, the operative time was documented. Average surgical time was 24.57 ± 2 min, range 12–44 min. In the first day postoperative the eye was examined for the sign of any complication(s) under slit lamp. Medication postoperatively was combination of Tobramycin-Dexamethasone six hourly for one month and artificial tear four times daily for two months, at the end of second week postoperatively sutures were removed. All patients were followed up as follow; first day, first week, second week, one month, 6 months after the operation. At each postoperative visit, biomicroscopical slit-lamp examination was done searching for sign of any recurrence and complications (granuloma formation, subconjunctival haemorrhage, corneal scar, cyst), any complaint was recorded.

3. RESULTS

A total of 90 eyes of 90 patients with primary pterygium were included in this study, they underwent surgical excision with conjunctival auto graft. Their age started from (25) years to (74) years. The mean age of group A was (46.84 ± 12.7) years, and the mean age of group B was (49.67 ± 12.3) years ($p=0.07$). (Table 1). Group A had 31(68.9%) male and 14(31.1%) female, while group B had 22(48.9%) male and 23(51.1%) female.

Table 1: Age distribution between two groups

	Frequency	Percent
polisher	25-34	9 20.0
	35-44	8 17.8
	45-54	17 37.8
	55-64	7 15.6
	65-74	4 8.9
	Total	45 100.0
blade	25-34	6 13.3
	35-44	12 26.7
	45-54	8 17.8
	55-64	13 28.9
	65-74	6 13.3
	Total	45 100.0

In both groups, they present with different grades, from I to IV. Group A included grade I- 5 (11.1%) patients, grade II-13 (28.9%), grade III-24 (53.3%), grade IV-3 (6.7%). Group B included grade I-7 (15.6%), grade II-21 (46.7%), grade III-15 (33.3%), grade IV-2 (4.4%). (Table 2).

Table 2: Grading of pterygium

		Frequency	Percent
polisher	one	5	11.1
	two	13	28.9
	three	24	53.3
	four	3	6.7
	Total	45	100.0
blade	one	7	15.6
	two	21	46.7
	three	15	33.3
	four	2	4.4
	Total	45	100.0

In most of cases sign of irritation was the chief complain for group A 20(44.4 %)in group B 22 (48.9 %) and for cosmetics the same in both groups for each 10 (22.2%), blurring of vision in group A 7 (15.6%)and 8 (17.8%) in group A IOL measurement was 7 (15.6%) and in group B 4 (8.9%) and obscure visual axis for each group only one (2.2%) patient.

Most of the cases had no risk factors in group A 20 (44.4%) and 22 (64.4%) in group B, and10 (22.2%) patient was smoker in group A and 9(20.0%) in group B,15 (33.3%) had sun exposure in group A 7 (15.6%) in B. Both groups were not statistically significant in age, gender, grading, indications and the risk factor p value more than 0.05. There were no complications in 38(84.4%) cases of group A and 27 (60.0%) cases of group B, in each groups 4 (8.9%) cases had granuloma and 2 (4.4%) cases had corneal inflammation, and only one (2.2%) case had retention cyst in group B, corneal scar happens in only one (2.2%) case of group A while in 11 (24.4%) cases in group B, there were more cases of complication (corneal scar) among the group B, there is statistical significant between two groups in the rate of complication p value = 0.01 (Table 3).

Table 3: Development of complications.

		Frequency	Percent
polisher	no complication	38	84.4
	granuloma	4	8.9
	Corneal scar	1	2.2
	inflammation	2	4.4
	Total	45	100.0
blade	No complication	27	60.0
	granuloma	4	8.9
	Retention cyst	1	2.2
	Corneal scar	11	24.4
	inflammation	2	4.4
Total	45	100.0	

The mean surgical time taken in group A was (20.2±6.2) min and in group B was (28.9±7.5) min, the mean surgical time was less in group A in compare to group B. The difference between two groups was significant p value = 0.001. The preoperative mean of BCVA in group A was 0.583, in postoperative the mean of BCVA became 0.726 p value= 0.000 and in group B the preoperative mean was 0.586 and in postoperative became 0.614 p value= 0.09, in both groups the change of BCVA was significant but the visual change was more significant in group A in compare to group B.

Patients were all checked for signs of recurrence of pterygium and recurrence was found in only one (2.2%) case of group A while in six (13.3%) cases of group B (Table 4) after six months of follow up. The recurrent rate difference between the two groups was significant p value = 0.04. After the period of 6 months of follow up no other recurrence was noted in the rest of the patients

Table 4: Group B six (13.3%) cases had recurrence and they were as follows.

No.	Age	gender	Grade	Other RF
Case 1	57	male	III	No RF
Case 2	58	male	III	smoker
Case 3	44	female	II	No RF
Case 4	35	female	II	No RF
Case 5	59	male	II	No RF
Case 6	40	female	II	No RF

To compare mean T test and for correlation chi square test were used at the significant level of 0.05. In this the of recurrence, complications and mean intraoperative time were significant (Table 5).

Table 5: Significant factors between two groups.

Variable	Percentage in group A	Percentage in group B	P value
Recurrence	2.2	24.4	0.04
Complication	20.22	28.93	0.01
Mean intraoperative time	20.22	28.93	0.001

4. DISCUSSION

Multiple factors affecting the recurrence of pterygium after excision, among them age, gender, grads, risk factors like smoking, sun exposure and the type of the surgery [20]. Despite various techniques and modifications of the procedure used for pterygium excision still the main complication is the recurrence, so the recurrence is still a big challenge and problem after pterygium surgery [21] and in general the recurrence take place within first 6 months postoperatively [22,23].

Depending on the fact that, restoration of the limbal anatomy after pterygium excision will decrease the chance of recurrences in future and smoothing of the corneoscleral bed is helping in this restoration which in turn lead to earlier reepithelialization and this will lead to corneal clarity enhancement postoperatively, in addition to that any attached remnants of the tissue which tightly adheres to the corneoscleral bed and cannot be easily removed will lead to regrowth of the fibro vascular tissue [9] which is considered to be one mechanism of pterygium recurrence [24] so to prevent this need excellent polishing and smoothing of the surface and this can be achieved with the use of motorized diamond-tipped drill [25] In this study we compare polishing with motorized diamond burr and manual polishing by crescent blade in the rate of recurrence, so patients divided into two groups, group A diamond burr used and group B crescent blade used for cleaning the surface.

Excision of the pterygium performed with the same technique in both groups using conjunctival auto graft since this technique has the highest success rate and the safest procedure in decreasing the recurrence [24,26], although fixing the graft with suture created

some complications related to the suture like: conjunctival granuloma, retention cyst, and conjunctival inflammation which were non serious complication in both groups [27]. Since no study could be found comparing the results of the two methods of corneal polishing, so we conclude the result from statistical analysis of the study and also the effect of other risk factors on the recurrence.

After follow up of six months only one(2.2%) case of group A recurrence has been observed and the case was a (34) year old male with grad(III) pterygium, the patient had history of sun exposure and he presented with sign of irritation , as we observe in this case with the use of diamond burr for polishing he had several factors affected the recurrence as in the study conducted by P Anguria P *et al* was Young patient's age determines pterygium recurrence after surgery, also in the study of BA Olusanya *et al* concluded that younger age less than 50 years of age to be a risk factor for recurrence, since the pterygium of this case was grad (III) and in the study of Tan DT *et al* [17] considered that pterygium morphology is a risk factor for recurrence, also in the study of Sang Won Ha *et al* discussed about the effect of ultraviolet radiation on pterygium and considered it as one of the risk factor which affect the recurrence beside young age group and morphology of the pterygium considered to be other risk factors, In the study of Soo Hyun Kwon *et al* analyzed the risk factors and concluded that younger age group and larger pterygium related to the recurrence. So in this study in spite of using motorized diamond burr recurrence took place because of presence of other multiple risk factors.

Group B had six (13.3%) cases of recurrence, they had less risk factors as demonstrated in the (table 4) three patients their age more than 50 years, four of them had grad II and only one patient has history of smoking, so the higher rate of recurrence in this group can only be explained due to the different technique used for polishing.

5. CONCLUSION

The study concluded that comparing the use of motorized diamond burr in polishing of the corneoscleral bed during excision of primary pterygium with the manual polishing by crescent blade gives better results in the rate of recurrence, beside that corneal polishing with diamond burr need less intra-operative time, it leaves less corneal scar and early visual recovery postoperatively. The instrument has low coast, easy to handle and little surgical expertise required. So using this tool is strongly recommended during pterygium surgery.

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