

# Analysis of the thickness of conjunctival autograft in pterygium surgery with the Moscovici dissection technique compared with manual dissection

Análise da espessura do autoenxerto conjuntival na cirurgia de pterígio com a técnica de dissecação de Moscovici comparada com a dissecação manual

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## ABSTRACT

**Objective:** Compare the thickness of conjunctival autografts in pterygium surgery using the Moscovici dissection technique with manual dissection and assess the difficulty of the techniques.

**Methods:** In this randomized clinical trial, 30 eyes of 30 patients undergoing pterygium surgery were divided into the Moscovici Dissection Technique Group and the Manual Dissection Group. The patients were treated at the Hospital Oftalmológico Visão Laser (Santos, São Paulo, Brazil). Optical coherence tomography was performed to measure graft thickness three months postoperatively. Three images were obtained from each eye, and three measurements were taken at a distance of 1.5mm perpendicular to the limbus in each capture. The surgeon graded the difficulty of obtaining the graft with the technique performed from one (lowest difficulty) to four (highest difficulty).

**Results:** We found statistically significant difference between the difficulty of the two techniques and the mean conjunctival autograft thickness in the two groups ( $p=0.01$  e  $p=0.05$ , respectively). The average difficulty rating for the Moscovici Dissection Technique Group (Air Group) was 1.47, while that for the Manual Dissection Group (MD group) was 2.20. The mean thickness of the three measurements was  $252\mu$  in the Air Group and  $298\mu$  in the MD Group, with medians of  $250\mu$  and  $278\mu$ , respectively.

**Conclusion:** Our study showed that the Moscovici technique results in thinner grafts and can be performed with greater surgical ease.

## RESUMO

**Objetivo:** Comparar a espessura de autoenxertos conjuntivais em cirurgia de pterígio utilizando a técnica de dissecação de Moscovici com a de dissecação manual e avaliar a dificuldade das técnicas.

**Métodos:** Neste ensaio clínico randomizado, 30 olhos de 30 pacientes submetidos à cirurgia de pterígio foram divididos em um Grupo de Técnica de Dissecação de Moscovici e um Grupo de Dissecação Manual. Os pacientes foram tratados e avaliados no Hospital Oftalmológico Visão Laser (Santos, São Paulo, Brasil). A tomografia de coerência óptica foi realizada para medir a espessura do enxerto 3 meses após a cirurgia. Três imagens foram obtidas de cada olho, e três medidas foram realizadas a uma distância de 1,5mm perpendicular ao limbo em cada captura. O cirurgião classificou a dificuldade de obtenção do enxerto com a técnica realizada de um (menor dificuldade) para quatro (maior dificuldade).

**Resultados:** Encontramos diferenças estatisticamente significantes entre a dificuldade das duas técnicas e a espessura média do autoenxerto conjuntival nos dois grupos ( $p=0,01$  e  $p=0,05$ , respectivamente). A classificação média de dificuldade para o Grupo de Técnica de Dissecação de Moscovici foi de 1,47, enquanto a do Grupo de Dissecação Manual foi de 2,20. A espessura média das três medidas foi de  $252\mu$  no Grupo de Técnica de Dissecação de Moscovici e de  $298\mu$  no Grupo de Dissecação Manual, com medianas de  $250\mu$  e  $278\mu$ , respectivamente.

**Conclusão:** Nosso estudo mostrou que a técnica de Moscovici resulta em enxertos mais finos e pode ser realizada com maior facilidade cirúrgica.

## INTRODUCTION

Pterygium is a benign, triangular, fibrovascular degeneration of the conjunctiva and the Tenon capsule. It is formed in the interpalpebral region and extends toward the cornea, affecting the Bowman's membrane and the superficial layers of the stroma.<sup>(1,2)</sup> The worldwide prevalence varies from 0.7% to 58.8%, being more common in intertropical regions due to greater exposure to ultraviolet (UV) radiation,<sup>1</sup> despite its multifactorial pathogenesis.<sup>(3,4)</sup>

Autologous conjunctival graft (ACG) surgery is the gold standard when surgical treatment is indicated. The pterygium is removed, and a single piece of conjunctival tissue is resected and used to cover the exposed area. Fibrin glue is usually used for graft fixation due to the lower recurrence incidence, ranging from 3.3% to 16.7%.<sup>(5-7)</sup> The risk of recurrence (RR) with this approach is 0.47.<sup>(4)</sup>

The thickness of the ACG is a vital consideration when this procedure is performed, as thinner grafts provide better aesthetic results and reduce the risk of complications such as granulomas and recurrence.<sup>(8,9)</sup> However, manual dissection (MD) of the ACG can be a complex surgery to perform, which can increase the operating time and the risk of complications.<sup>(9-25)</sup>

The Moscovici technique is a simple and inexpensive new approach to ACG dissection, which can guarantee thinner grafts and greater surgical ease. Moscovici dissection is a modification of previously published pterygium surgery techniques. A 3mm syringe connected to a 30:1/2G insulin needle (13x4.5mm) is filled with 0.5 to 1mL of air. The air is injected under the conjunctival epithelium as far from the stroma as possible.<sup>(15-17)</sup>

Moscovici dissection involves no additional costs, making it easy to incorporate into daily practice. We believe this approach can reduce the learning curve required for conjunctival graft surgery and shorten the surgical time. With this technique, thinner grafts can be obtained, with less stroma, proliferation, and lymphatic vessels, can reduce the RR and provide better cosmetic results because of a greater transparency.<sup>(13,18)</sup>

The primary objective of this study was to use optical coherence tomography (OCT) to compare pterygium surgery conjunctival autograft thickness when the Moscovici dissection technique (Air Group) is used to the thickness achieved with MD. The secondary objective was to compare the difficulty of the two dissection techniques.

## METHODS

### Study design

This was a randomized clinical trial with two groups of patients requiring pterygium surgery. In one Air Group, the Air was used; in the other, MD (MD Group) was used. The study was conducted according to the CONSORT guidelines for clinical research (<http://www.consort-statement.org>). All patient data were anonymous to comply with the ethical principles of resolution 466/12 of the National Health Council of Brazil. The study followed the tenets of the 2023 revision of the Declaration of Helsinki. All patients signed informed consent.

### Sample calculation

The number of patients required was calculated using a repeated measure ANOVA with a significance of 5% and a test power of 95% on Minitab 18 version 18 (Minitab, LLC, State College, Pennsylvania, United States) software. As a result of the calculation, the sample comprised 30 eyes (30 patients) equally divided between the two groups.

### Participants

Participants in the Air Group underwent the Air, while those in the MD Group underwent MD.

Recruitment complied with resolution 466/2012, which regulates research with human participants in Brazil. The study sample consisted of patients diagnosed with pterygium from the general outpatient clinic of the Hospital Oftalmológico Visão Laser (Santos, São Paulo, Brazil) between February and June 2022.

The sample was randomized into two groups using randomization software by Sealed Envelope Ltd. (London, UK). Participants were then assigned sequential numbers according to the recruitment order for anonymity. Data analysis was performed by a third person, who did not know the group allocations. Based on a calculation of the minimum sample size with sufficient power, 30 eyes (from 30 patients) were evaluated, 15 of whom were assigned to the Air Group and 15 to the MD Group.

The inclusion criteria were adults (over 18 years of age) of both sexes, eyes with nasal or temporal pterygium of grade one to three). The exclusion criteria were a history of a limbus, ocular surface, cornea, sclera, or episcleral pathology; a history of corneal trauma, previous eye surgery, or recurrent pterygium; contact lens wearers; patients who were pregnant or lactating; and those with immunodeficiency, keratoconus, or double-headed pterygium.

## Exams performed

Participant data collected were age, sex, race, duration, laterality, and pterygium-related symptoms (pain, redness, foreign body sensation, and irritation). Spectralis anterior chamber OCT (Heidelberg Engineering, Heidelberg, Germany) was performed to determine conjunctival autograft thickness. Each participant underwent an ophthalmologic examination of visual acuity with correction using the Snellen chart at 6m, refraction (subjective), intraocular pressure, and slit lamp biomicroscopy. All exams were performed before excision and three months after the surgical procedure. The lesions were classified by biomicroscopy according to their extension in the corneal limbus and pupil as grade (G) I (lesions extending up to 1 mm from the limbus), G II (lesions extending beyond 1 mm from the limbus without affecting the pupillary region), G III (lesions that reached the pupil) and G IV (lesions extending beyond the pupil).<sup>(19,20)</sup>

Patients were clinically evaluated on the first and seventh postoperative days and then at one and three months. Optical coherence tomography was performed to measure graft thickness three months postoperatively. This was performed in a low-light environment, with the patient's chin and head well-positioned. The same trained professional performed all exams. Three images were obtained from each eye, and three measurements were taken at 1.5mm perpendicular to the limbus in each capture. The one with the best parameters and quality was selected for the data collection of the three images.

In each instance, the surgeon graded the difficulty of obtaining the graft with the technique performed. The grading ranged from one (lowest difficulty) to four (highest difficulty).

## Surgical procedure

All surgeries were performed by the training residents, accompanied by the same experienced surgeon, which did not participate in this paper, following the same asepsis and antisepsis procedures and operative technique. This comprised topical anesthesia, with a subconjunctival anesthetic (xylocaine 2% associated with epinephrine) infiltration at the pterygium site, after which the pterygium head was removed with a 15-blade scalpel and corneal dissection. The pterygium head and body were resected from the underlying sclera 4–5 mm from the limbus. Dissection of the subconjunctival fibrous tissue was performed, leaving a bare scleral bed. The area was then covered with a free limbal conjunctival autograft from

the superior bulbar conjunctiva freed from the Tenon capsule. The CAG was fixed in the limbus with biological glue. Postoperatively, we prescribed topical gatifloxacin 0.3% and topical prednisolone 1% for one week, after which the antibiotic was discontinued, and treatment with prednisolone 1% was maintained in regression for a further three weeks.

## Statistical analysis

Spearman's correlation coefficient was used to identify associations between variables. A p-value of <0.05 was considered statistically significant, with a 95% confidence interval (CI). Statistical analyses were performed using SPSS version 20, Minitab 16, and Excel Office 2010 software.

We tested the normality of the primary outcome quantitative variables using the Shapiro-Wilks test ( $n < 30$ ) and found no distribution of assured normality. We used the Mann-Whitney test for the quantitative variables and Fisher's exact test to determine the distribution of qualitative factors (percentage or prevalence) to compare the techniques.

Finally, we used Spearman's correlation coefficient to identify correlations between age, difficulty, and mean graft thickness (the mean for each patient across the three measurements taken).

## RESULTS

Our analysis found statistically significant differences between the MD and Air techniques for both difficulty and mean graft thickness (p-values of 0.01 and 0.05, respectively). The average difficulty in the Air Group was 1.47, and that in the MD Group was 2.20. The mean graft thicknesses between the three measurements were significantly different between the two groups, with a mean thickness of 252 $\mu$  in the Air Group and 298 $\mu$  in the MD Group and median thicknesses of 250 $\mu$  and 278 $\mu$ , respectively (Table 1).

**Table 1.** Technique comparison for quantitative measures

	Mean	Standard deviation	Q1	Q3	n	CI	p-value
Difficulty							
AIR MD	1,47	0,74	1	2	15	0,38	0,01
	2,20	0,86	2	3	15	0,44	
Medium thickness							
AIR MD	252	46	219	273	15	23,5	0,05
	298	66	243	336	15	33,8	
Age							
AIR MD	46,3	14,7	39,5	57,0	15	7,4	0,60
	48,9	13,6	42,0	56,0	15	6,9	

Medium thickness in  $\mu$ ; age in years.

CI: confidence interval; AIR: Moscovici dissection technique; MD: manual dissection.

**Table 2.** Comparison of techniques for distributing qualitative factors

	AIR Group		MD Group		Total		p-value
Complications							
No	15	(100)	15	(100)	30	(100)	1,00
Yes	0		0		0		
Eye							
OD	6	(40,0)	10	(66,7)	16	(53,3)	0,10
OS	9	(60,0)	5	(33,3)	14	(46,7)	
Sex							
Female	8	(53,3)	6	(40,0)	14	(46,7)	0,22
Male	7	(46,7)	9	(60,0)	16	(53,3)	
Pterygium grade							
Nasal 1	1	(6,7)	0		1	(3,3)	0,59
Nasal 2	10	(66,7)	11	(73,3)	21	(70,0)	
Nasal 3	4	(26,7)	4	(26,7)	8	(26,7)	

Results expressed as n (%).

AIR: Moscovici dissection technique; MD: manual dissection; OD: right eye; OS: left eye.

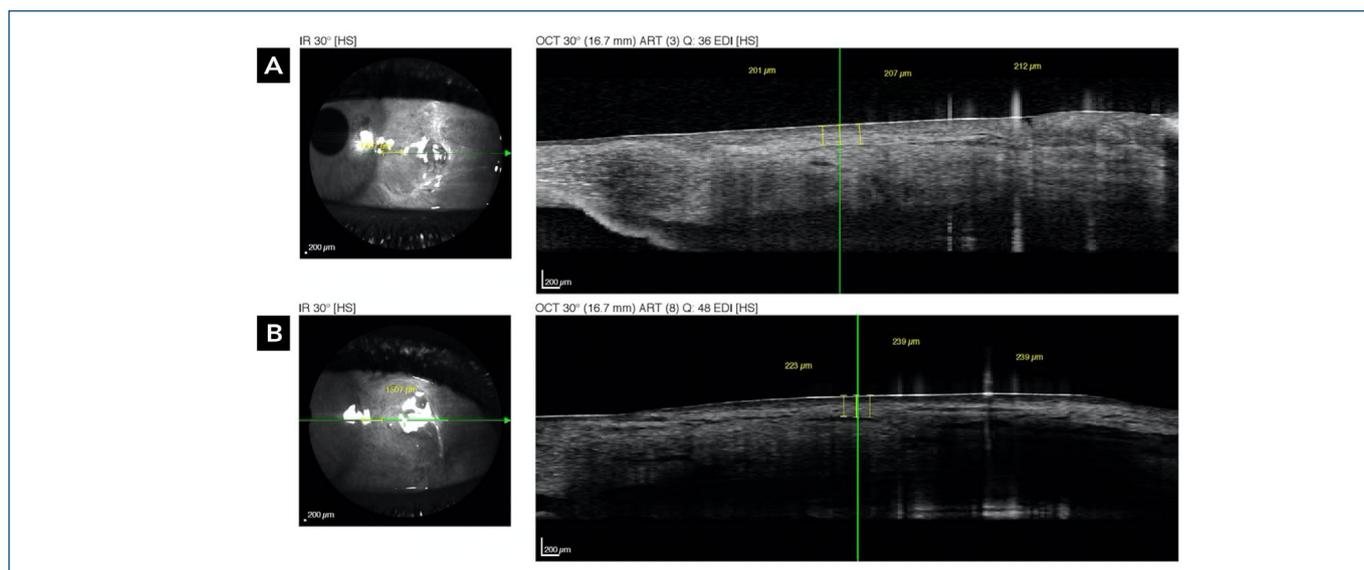
**Table 3.** Correlation of age with difficulty and mean thickness

	Age Corr (r)	Age p-value
Difficulty	-0,08	0,67
Mean thickness	-0,13	0,46

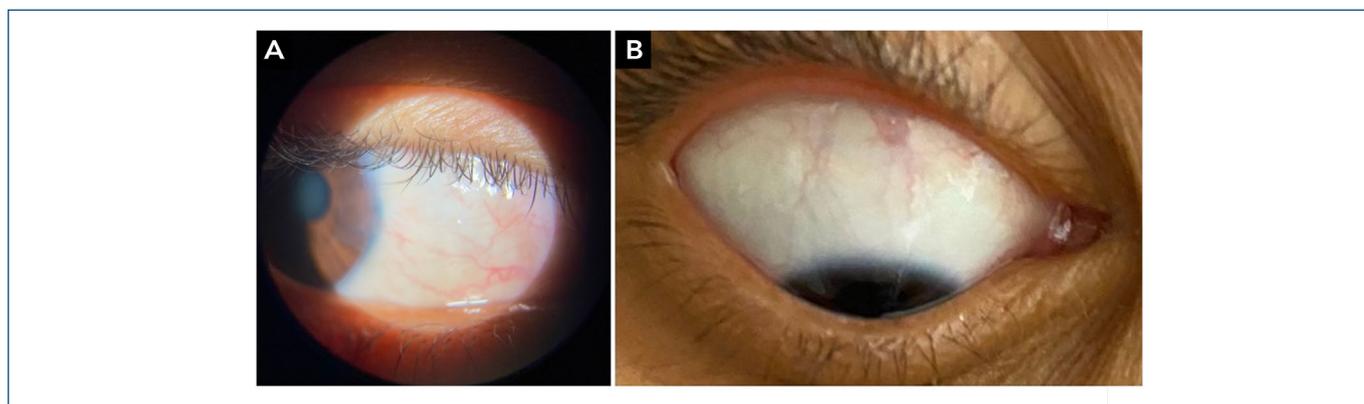
We found no significant differences between the techniques in the distributions of qualitative factors. Thus, the technique used did not correlate with the pterygium’s severity, the patient’s sex, or the affected eye (Table 2). Moreover, there was no correlation between age and difficulty or age and mean graft thickness meaning that results are considered statistically independent.

Furthermore, we found no correlation between either patient age and difficulty or patient age and average thickness, so the results were considered statistically independent (Table 3).

We could conclude that Air is superior to MD in the level of surgical difficulty (Figure 1A) and the mean thickness of the ACG (Figure 1B), and these differences were not modified by any of the other clinical and demographic variables measured.



**Figure 1.** Previous follow-up optical coherence tomography image at three months postoperatively with three measurements at a distance of 1.5mm perpendicular to the limbus. (A) Image using the Moscovici dissection technique. (B) Image using the manual dissection technique.



**Figure 2.** Photos at the slit lamp 3 months after surgery for excision of a grade II pterygium using the Moscovici dissection technique. (A) Autologous conjunctival graft implant site in the nasal region. (B) Autologous conjunctival graft pick-up location in the upper region.

## DISCUSSION

New techniques in pterygium surgery with better results, shorter surgical duration, more effective and reproducible techniques, and greater surgical ease are always helpful. This is even more true with the recent shift in the primary purpose of pterygium surgery, which is increasingly becoming a form of cosmetic surgery.<sup>22</sup> Consequently, there is a growing search for excellence in functional and aesthetic results.

With the advent of fibrin glue, surgical duration has been considerably reduced. In a study by Rubin et al., the mean pterygium surgical duration was 48.5±7.13 minutes with suturing and 19.05±6.12 minutes with fibrin glue.<sup>(12)</sup> Hall et al. reported mean operative times of 12 minutes with fibrin glue and 26 minutes with sutures.<sup>(22)</sup> The Moscovici ACG technique has previously been found to reduce surgical duration, with experienced surgeons taking approximately 10 minutes with fibrin glue.<sup>(15)</sup>

An advantage of thinner ACGs is their minimization of the transfer of stroma/Tenon's capsule, fibroblasts, and lymphatic vessels to the excision site. These structures' absence or minimal presence can reduce cell proliferation, reducing the RR<sup>(24)</sup> and providing better aesthetic results, as the grafts can be more transparent, as seen in Figures 2A-B.

A study in which a femtosecond laser was used achieved an average ACG thickness of 74.5±9.8µm, while dissection with saline/anesthetic produced grafts of 107±18 µm, as measured with an OCT Visante.<sup>9,26,27</sup> These outcomes are quite different from those achieved in the present study. Probably due to the difficulty of the technique, the lack of a standardized protocol for measuring ACGs, and the fact that we used a different machine for measurement. Another fact that could have led to this difference, in our study, is that residents in training performed surgeries. However, we do not think this difference means our grafts were thicker since we had a control group, and the Air dissection method was superior to MD.

Our results showed a significant difference in the difficulty of the techniques, with Air being less complex, suggesting better surgical applicability than MD. The mean ACG thickness in the Air Group was significantly lower than in the MD Group, with the Air method producing thinner ACGs. However, there was no correlation between mean thickness and age or mean thickness and difficulty.

Although our results were statistically significant, this study had some limitations. The main limitation was the subjective judgment of the difficulty of the two

techniques, even considering that the same experienced surgeon performed them and that no comparison was made with ASG dissection using a femtosecond laser or dissection with the injection of subconjunctival fluid. We also excluded the use of mitomycin C based on its inhibitory action on the synthesis of fibroblasts and cell multiplication, as this has been shown to improve surgical results and reduce the RR.<sup>(24)</sup>

We evaluated two surgical dissection techniques in the pterygium surgery in the present study. We compared the difficulty in performing the two types of dissection and evaluated the surgical results based on the average ACG thickness achieved with each method. We found that a thinner ACG was achieved using the Air technique than the MD technique and that Air dissection is easier to perform, enabling better results and a shallower learning curve.

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