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## THE SURGICAL REPAIR OF THE CORNEA OF THE DOG USING PERICARDIUM AS A KERATOPROSTHESIS

### REPARAÇÃO CIRÚRGICA DA CÔRNEA DE CÃO USANDO PERICÁRDIO COMO PRÓTESE

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#### SUMMARY

Significant advances in corneal repair have been made in the past. Tissue graft has been used to repair full-thickness defects of the cornea and sclera. Equine pericardium preserved in glycerol was used to repair full-thickness corneal lesions after limbal melanoma excision and corneal wound with iris prolapse. A six-year old male, German Shepherd, with 1 cm of diameter, dark-pigmented mass at the temporal limbus of the right eye, with two months of evolution, and a four month old female mixed breed dog, with a corneal wound and iris prolapse, in the left eye, secondary to a cat scratch 5 days earlier. In both cases a piece of pericardium was sutured close to the corneal defects. An antibiotic ointment and atropine 1% eye drops were used. The intraocular pressure was low in the following days, but arose to normal values. All other structures were normal. A granulation tissue initially grew near the patch, and the opacity of the pericardium remained. Dexamethasone eye drops and ointment were used, and the granulation tissue disappeared two months after surgery. Eighteen months follow-up showed the eyes in good condition, although opaqueness was still present.

**UNITERMS:** Dogs; Cornea; Pericardium; Prosthesis.

#### INTRODUCTION

The repair of corneal wounds has been the object of research in human and veterinary ophthalmology.

In veterinary ophthalmology, and specially in small animals, several techniques are used to repair corneal lesions: tarsorrhaphy<sup>1,2,3</sup>; conjunctival flap<sup>15,24</sup> and third eyelid flap<sup>11</sup>; tissue adhesives<sup>19</sup>; contact lenses<sup>2</sup>; corneal-scleral transposition<sup>16</sup>; autogenous corneal transplant<sup>6,8</sup>; homologous corneal grafts<sup>5,10,13,14,20</sup> and, synthetic graft<sup>22,27</sup>.

Keratoprostheses, by using alloplastic materials such as acrylic<sup>7</sup> or carbon<sup>2</sup>, have been developed as an alternative mode of treatment for a group of diseases like alkaline burns, severe dry eye syndrome and severely vascularized corneas.

Limbal melanomas are less aggressive than those that originate in the anterior uvea, they are slow growing and localized tumors<sup>26</sup>. Surgical excision of those tumors is indicated with a good prognosis<sup>21</sup>. The average age for finding epibulbar melanocytomas is 6 years<sup>9</sup>, and breed incidence is higher in the German Shepherd<sup>26</sup>. Penetration of the anterior chamber is not uncommon during tumor removal, and depending

on the extent of the lesion, a fullthickness keratoplasty must be done.

The pericardium has been used in the repair of the oesophagus<sup>4</sup> and thoracic wall<sup>25</sup> with good results. In veterinary ophthalmology it has been used in the repair of entropion, filling of the orbital cavity following enucleation<sup>3</sup> and repair of the sclera and third eyelid<sup>1</sup>.

This paper is to report two cases in dogs, in which we used the pericardium to repair corneal lesions after a limbal melanoma removal and corneal wound, with iris prolapse.

#### Harvesting and Preservation of the Pericardium

The pericardium must be harvested from an animal which did not die of an infectious disease. One cleans the fat tissue from the pericardium and, with no special care, the piece of pericardium can be put in a recipient with glycerol 98% in salt solution and kept at room temperature. The maximum storage period is undetermined and the membrane can be used after a 30 day period of preservation. Before

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use, the fragment of pericardium must be rehydrated in balanced salt solution.

### Case One

A six - year old, male German Shepherd was referred to the Ophthalmology Section of the Veterinary Teaching Hospital, University of São Paulo for examination.

The dog presented a black mass developed in two months, with 1 cm diameter, and located at the temporal limbus of the right eye (Fig. 1). No other anomaly was noted. A superficial sclero-keratectomy for removal of the mass was indicated. During surgery, a penetrating keratectomy was performed, due to the extension of the neoplasia, and a graft of equine pericardium preserved in glycerol 98% was sutured at the lesion site, using simple interrupted 6-0 silk sutures (Fig.2). A Gentamicin ophthalmic ointment and atropine 1% eye drops were administered QID for 15 days, as well as a dexamethasone 0.1% eyedrops QID.

Intraocular pressure was low at the first week post surgery, raising to normal values (Schitz) on the 30 th day. The anterior chamber had normal depth throughout the follow-up period. Fundus exam revealed no abnormality.

Granulation tissue grew over part of the graft and sutures at the limbal sight, disappearing after two months of topical steroid administration.

Eighteen months after surgery, the eye structures were in good condition and both vision and aesthetics were preserved (Fig.3). Opacity of the cornea persisted at the site of implant.

### Case Two

A four-month old female, mixed breed dog was referred to the ophthalmology section of the veterinary teaching hospital, University of São Paulo, for repair of a corneal wound, secondary to a cat scratch 5 days earlier. At presentation, a round vesicular mass, 1.5 cm square, at the 6 o' clock position near the limbus was present (Fig. 4). A shallow anterior chamber with an irregular pupil was noted.

Partial keratectomy and iridectomy of the portion of the iris incarcerated in the corneal wound were performed at the site of lesion (Fig.5), and an equine pericardial graft was used to close the lesion, by using a simple interrupted 7-0 prolene suture (Fig. 6).



FIGURE 1

Case 1: Temporal position of the black mass.



FIGURE 2

Case 1: Graft in position, one week after surgery.



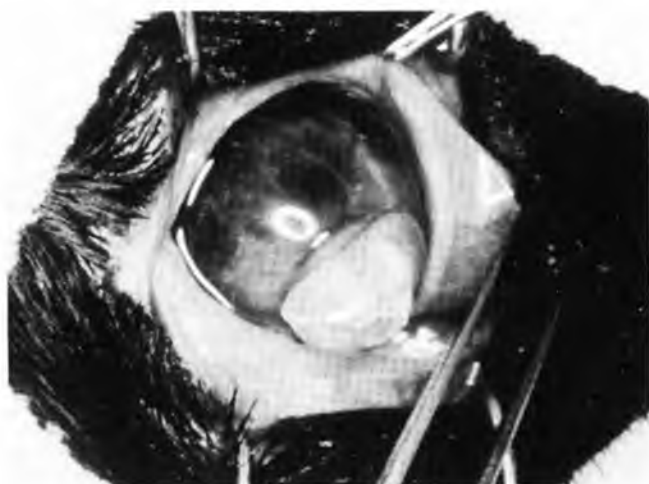
FIGURE 3

Case 1: Graft eighteen months after surgery.

Four months later, a normal anterior chamber and cornea in good condition with opacity at the graft site could be observed.

### DISCUSSION

The development of alloplastic material and its use in surgical repair revealed applications in ophthalmology and stimulated investigations of these materials as keratoprosthesis. Various types of autologous grafts or donor tissue, as well as tissue adhesives, have been used in the treatment of corneal wounds.



**FIGURE 4**

Case 2: The vesicular mass at 6 O'clock, at presentation.



**FIGURE 5**

Case 2: Fullthickness keratectomy and iridectomy.



**FIGURE 6**

Case 2: Prosthesis sutured at the corneal lesion.

Biological membranes, especially pericardium, have been used in veterinary ophthalmology with good results. The pericardium was well tolerated by the canine cornea, and no extrusion of the implant or necrosis of the surrounding tissue were noted. This is good material because it is easy to get, to store and to use.

In both cases, during the follow-up, a deep anterior chamber revealed that the graft did properly seal the corneal lesion and that the aqueous did not leak.

Low IOP in the first days after surgery probably was due to the anterior uveitis, that remitted in a few days with topical steroid. Granulation tissue disappeared in two months of steroid treatment.

Opacity at the site of implantation did not interfere with vision because it was out of the visual axis.

These results suggest that the pericardium should be a good material to repair lesions of the cornea and experimental investigations are being conducted in order to understand the behavior of this membrane and surrounding tissues.

## RESUMO

A substituição da córnea em lesões oculares tem merecido a atenção dos oftalmologistas, sendo que vários materiais têm sido usados para este fim. O pericárdio de equino, conservado em glicerina, foi usado no reparo de lesões penetrantes de córnea de dois cães, um pela excisão de melanoma límbico, outro pela presença de estafiloma periférico. Cão, Pastor Alemão, com 6 anos de idade, apresentando massa de 1 cm de diâmetro, localizada na região temporal do limbo esclero-corneano do olho direito, com 2 meses de evolução e cão de 4 meses, mestiço, que teve ferida sua córnea esquerda com prolapso de íris, em consequência de arranhadura de gato, 5 dias antes, foram examinados no Serviço de Oftalmologia do Hospital Veterinário da Faculdade de Medicina Veterinária e Zootecnia da Universidade de São Paulo. As lesões de ambos os animais foram reparadas com fragmento de pericárdio de equino para fechamento do defeito produzido. Aplicação de pomada antibiótica e colírio de atropina de 1% foi instituída no pós-operatório. A pressão intra-ocular foi baixa nos primeiros dias subsequentes à cirurgia, mas foi gradativamente aumentando chegando a valores normais. Inicialmente, tecido de granulação foi observado próximo ao implante, e opacificação do pericárdio permaneceu. Colírio de dexametasona foi então indicado, sendo que o tecido de granulação desapareceu dois meses após a cirurgia. A câmara anterior permaneceu profunda durante toda a evolução. O acompanhamento pós-operatório mostrou os olhos em boas condições após dezoito meses.

**UNITERMOS:** Cães; Córnea; Pericárdio; Prótese.

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