Histol Histopath (1990) 5: 415-425

Histology and Histopathology

Results and histological development of various surgical techniques for correcting eversion of the third eyelid in dogs

M.C. Mañé[1], M.A. Vives[1], R. Barrera[1] and J.A. Bascuas[2]

[1] Department of Medicine and Animal Health, Faculty of Veterinary, University of Extremadura, Cáceres and [2] Department of Animal Pathology, Facultad de Veterinaria, University of Zaragoza, Zaragoza, Spain

Summary. An experimental study was made of 20 dogs in order to compare various surgical techniques used to correct eversion of the third eyelid, namely resection of most of the cartilage, resection of the central portion of the cartilage, and cartilage homotransplantation. An analysis was made of histological results obtained 45 days after operation, the most satisfactory result being recorded for homotransplantation of the third eyelid cartilage.

Key words: Third eyelid, Dog, Histology

Introduction

Sisson and Grossman (1974) report that the third eyelid is situated in the medial angle of the eye, and is covered by conjunctiva which is palpebral in the external part, connected to the eyelid, and bulbar in the internal part being connected to the globe. Inside this, there is a T-shaped cartilage, the crosspiece of which lies on the free edge of the lid while the stem points backwards. This part of the cartilage is enveloped by an accessory lachrymal gland, the third eyelid gland (Dyce et al., 1987).

One of the processes most frequently encountered in surgical pathology of the third eyelid is eversion due to the rolling-outwards of this cartilage. Helper (1975) advises against removal of the third eyelid, except in exceptional circumstances. For this reason, surgical correction of the eversion is achieved by removal of all or part of the cartilage (Gelatt, 1972; Magrane, 1973), although others assert that excision of the central buckled stem of this cartilage is sufficient (Helper, 1981; Cottrell and Peiffer, 1989). If the scrolling also affects the «crosspiece» of the T, almost all of the cartilage must be removed (Peiffer, 1985).

We would advocate homotransplantation for the correction of eversion of the third eyelid, with the aim of conserving its functions as far as possible (Usón et al., 1982; Mañé et al., 1988).

Microscopic comparisons of results are not generally available for the various surgical techniques used in cases suitable for surgery, except in necropsy or experimental studies.

In the specific case of the third eyelid, authors have provided only a gross description of results for their surgical techniques. For this reason it was decided to carry out an experimental study in order to draw up a microscopic comparison of the various types of surgery which have been described as suitable for the correction of eversion in the third eyelid.

Offprint requests to: Dra. M.C. Mañé, Departamento de Medicina y Sanidad Animal, Facultad de Veterinaria, Carretera de Trujillo s/n, 10071 Cáceres, Spain

Materials and methods

20 dogs were divided into 4 groups of 5, which underwent the following operations: exeresis of most of the cartilage of the third eyelid (Group 1), exeresis of the central part of the cartilage (Group 2) and homotransplantation of the cartilage (Group 3). The fourth group was used as a control.

45 days after operation, the eyelids were resected and stained with hematoxylin-eosin for microscopic analysis.

Results

Description of a normal third eyelid

The central part of the third eyelid contains a strip of hyaline cartilaginous tissue in which chondrocytes form isogenic, coronary and axil groups, these being separated by a homogenous matrix (Fig. 1).

On both sides of the cartilaginous axis, and in the middle portion of the third eyelid, there is a wide, dense network of slightly acellular conjunctive tissue in which the fibre component, consisting largely of collagen fibres, predominates (Fig. 2).

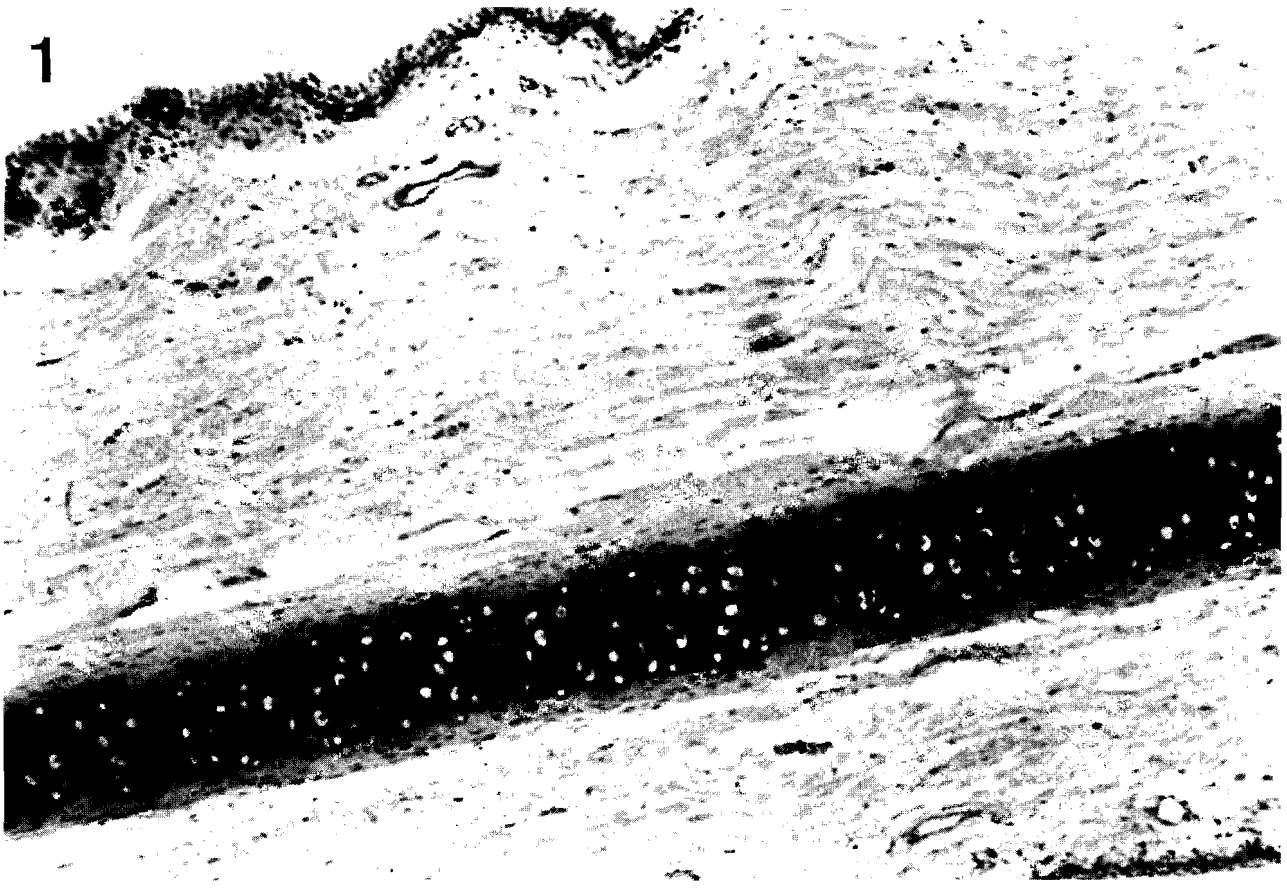

Fig. 1. Hyaline cartilaginous tissue with isogenic, coronary and axil groups of chondrocytes. × 120

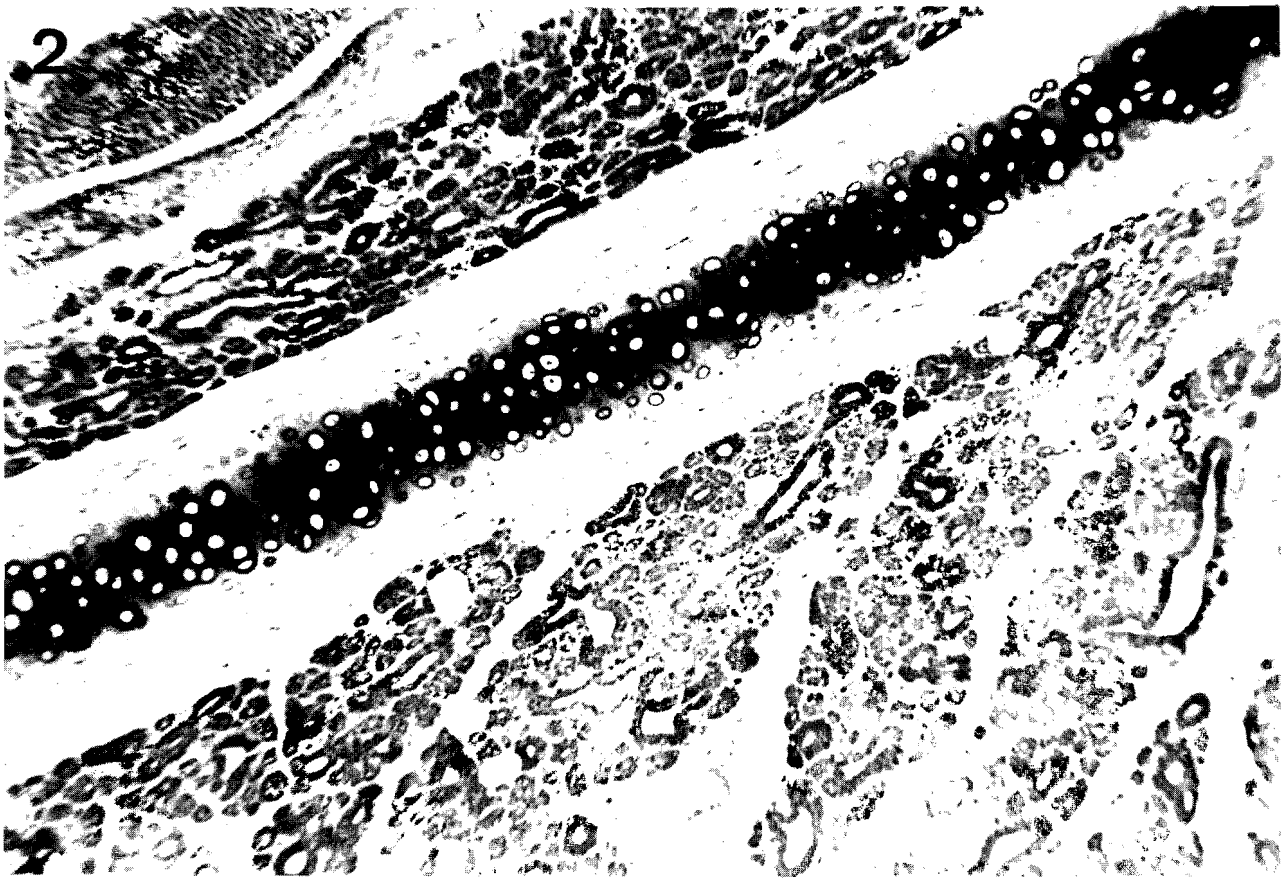

Fig. 2. Collagen fibres in dense network on both sides of cartilaginous axis. × 270

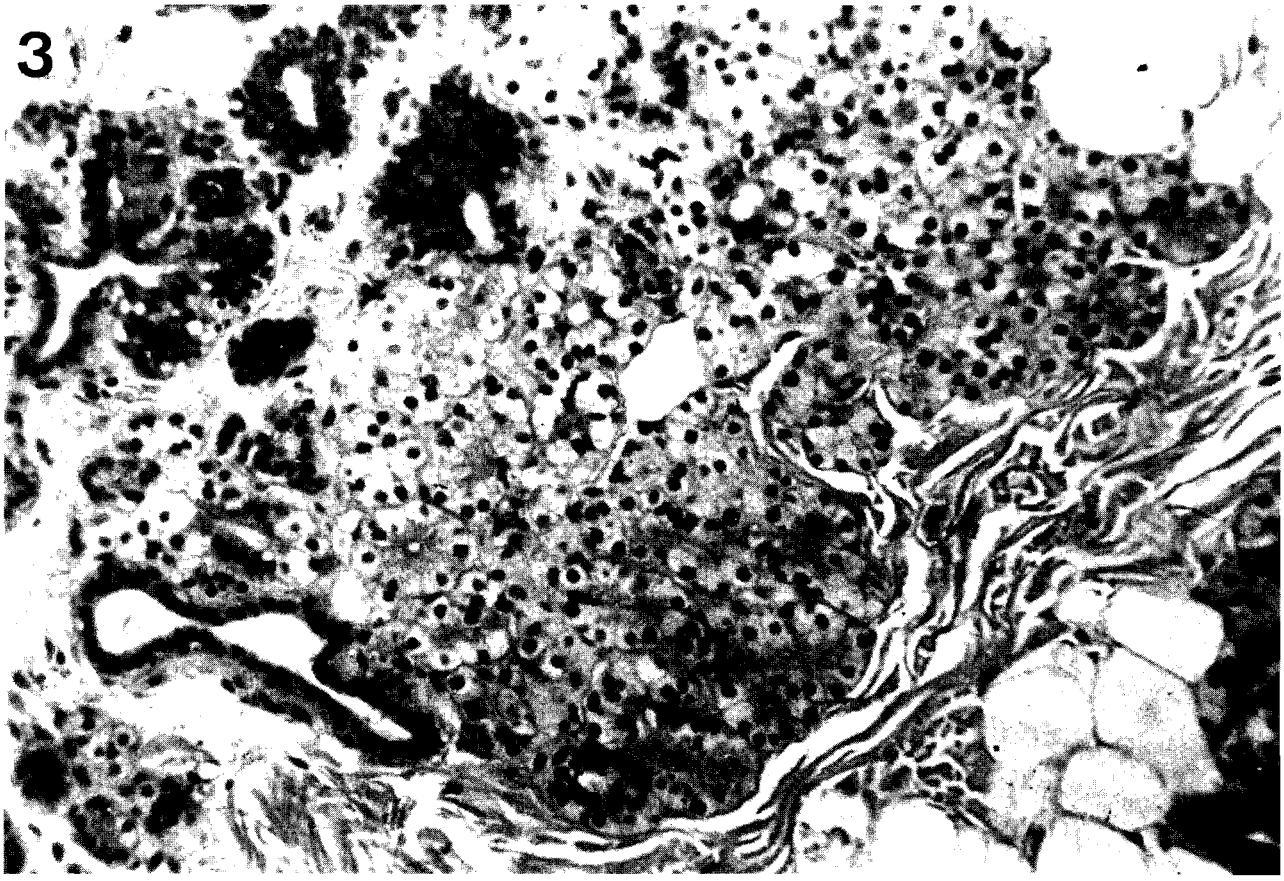

Fig. 3. Seromucous glands with secretory ducts and glandular acini in the deepest portion of the third eyelid. × 270

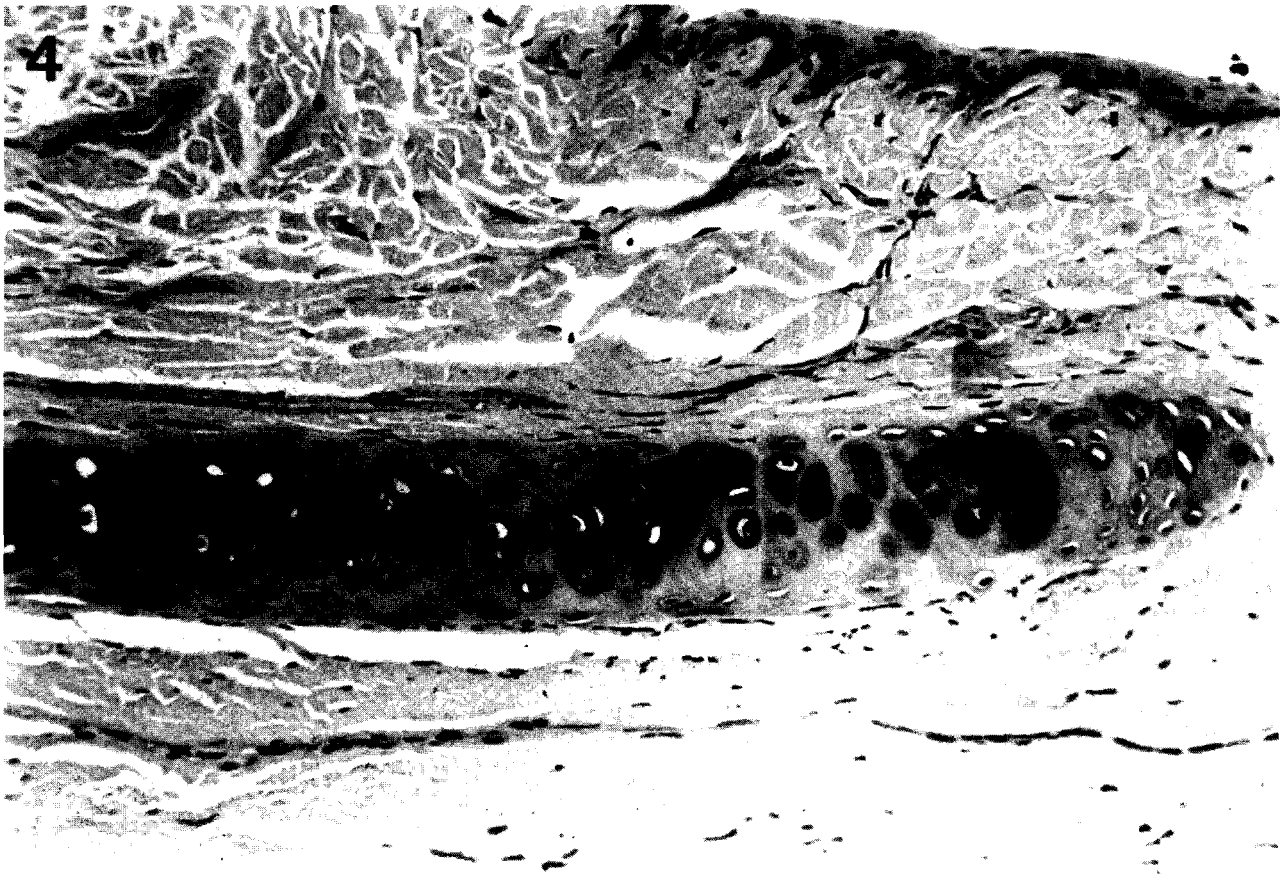

Fig. 4. Structure of the most distal portion of the third eyelid with epithelial lamina, conjunctive tissue and cartilaginous layers. × 270

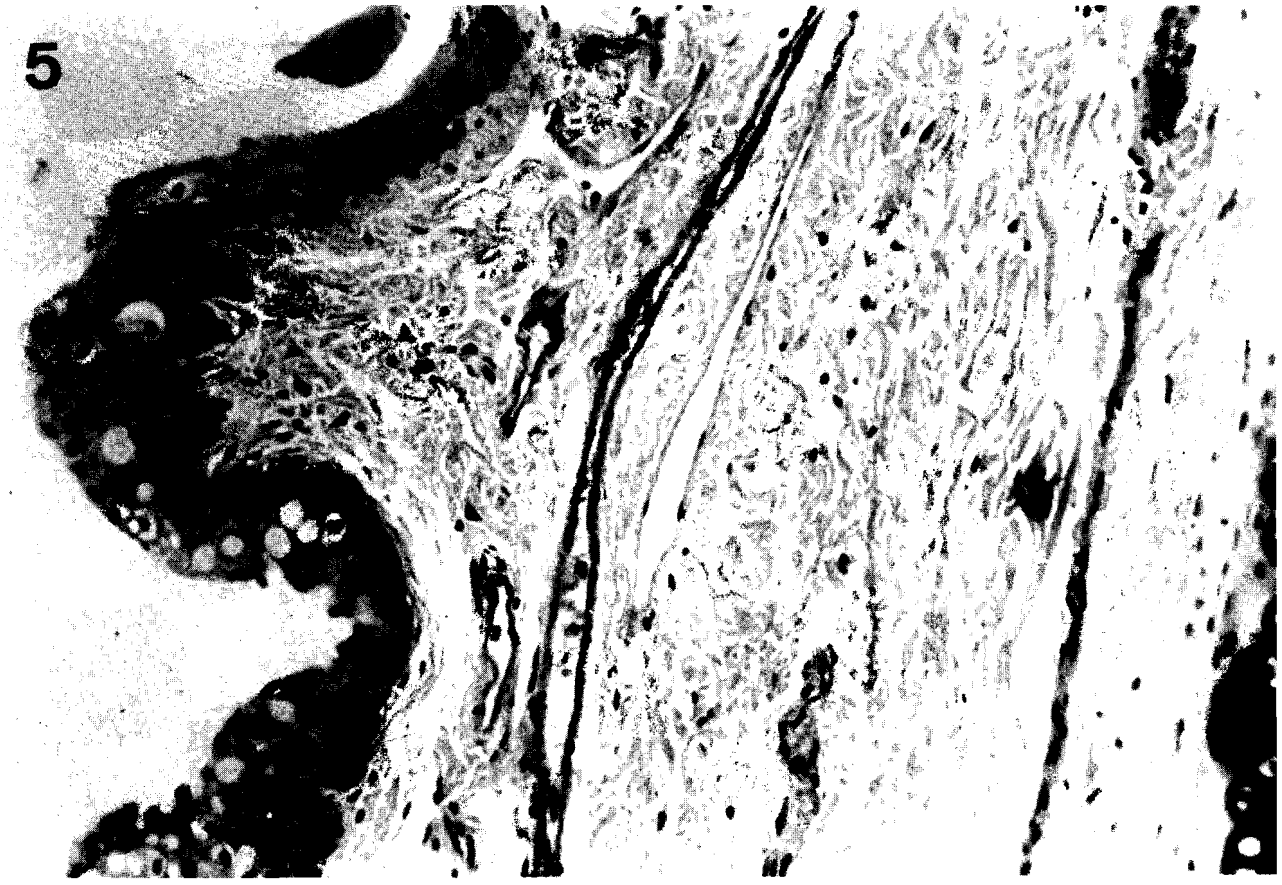

Fig. 5. Aspect of the conjunctiva of the bulbar surface with a wide network of blood and lymph vessels. × 270

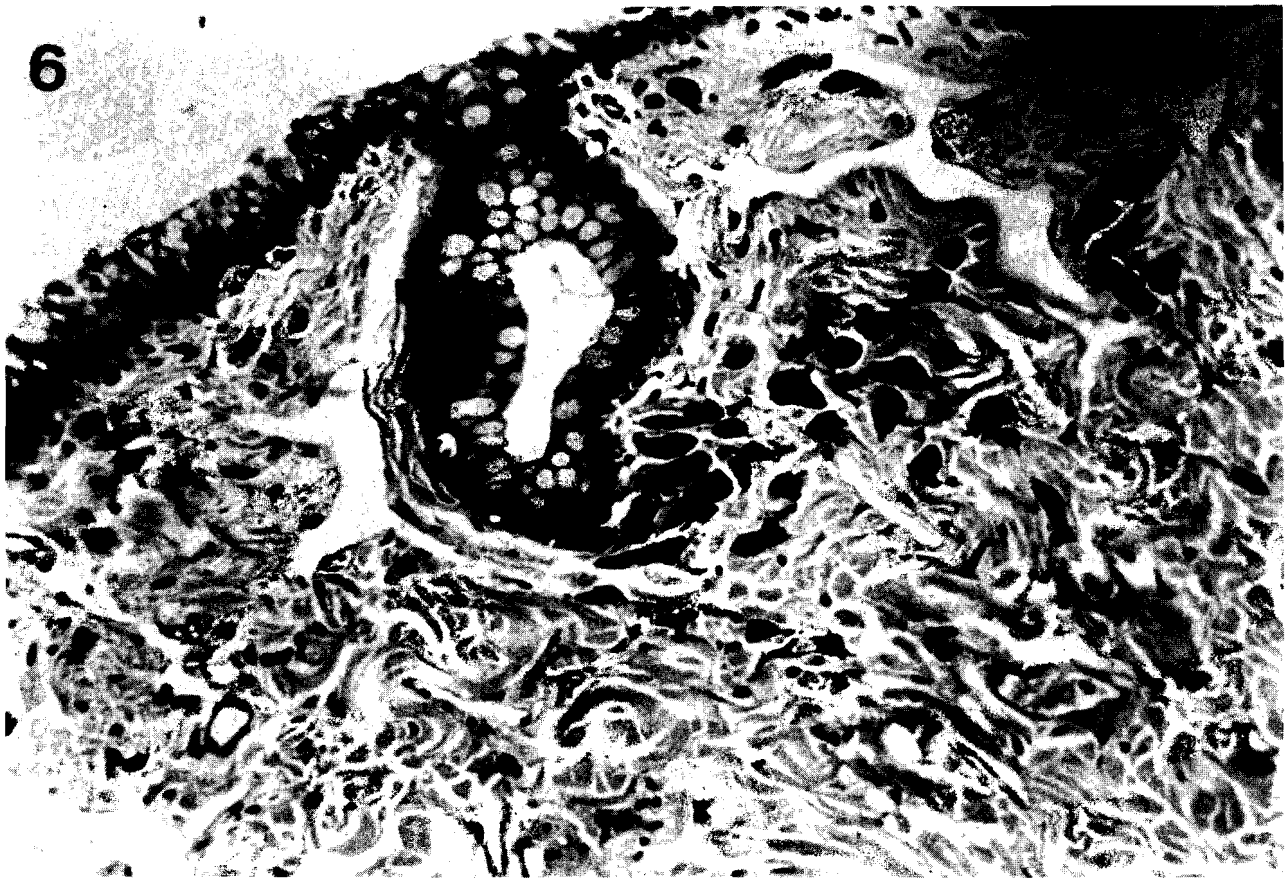

Fig. 6. Melanic pigment cells alongside the bulbar surface of third eyelid. × 270

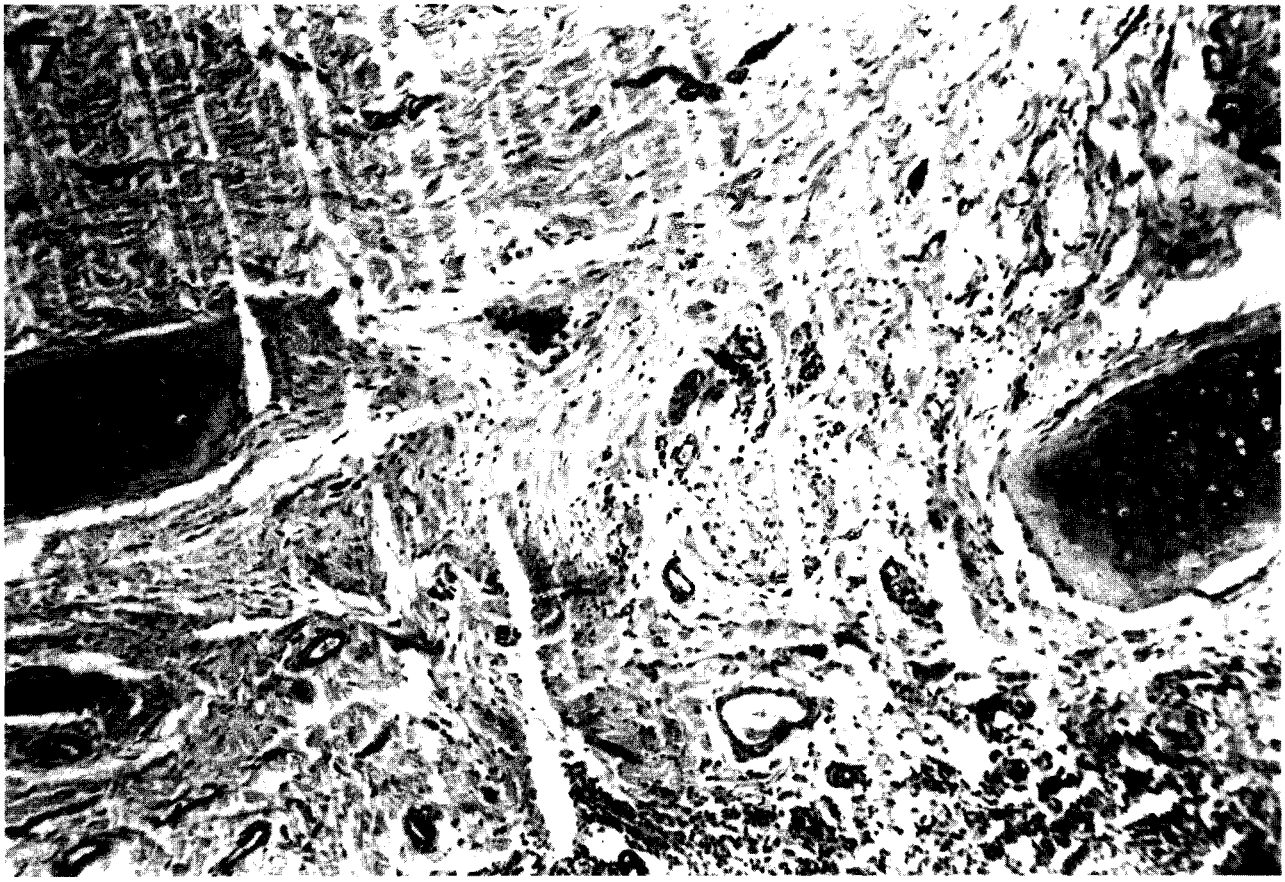

Fig. 7. Shortening of the space between the two cartilaginous parts after the removal of the greater part of the third eyelid cartilage. × 270

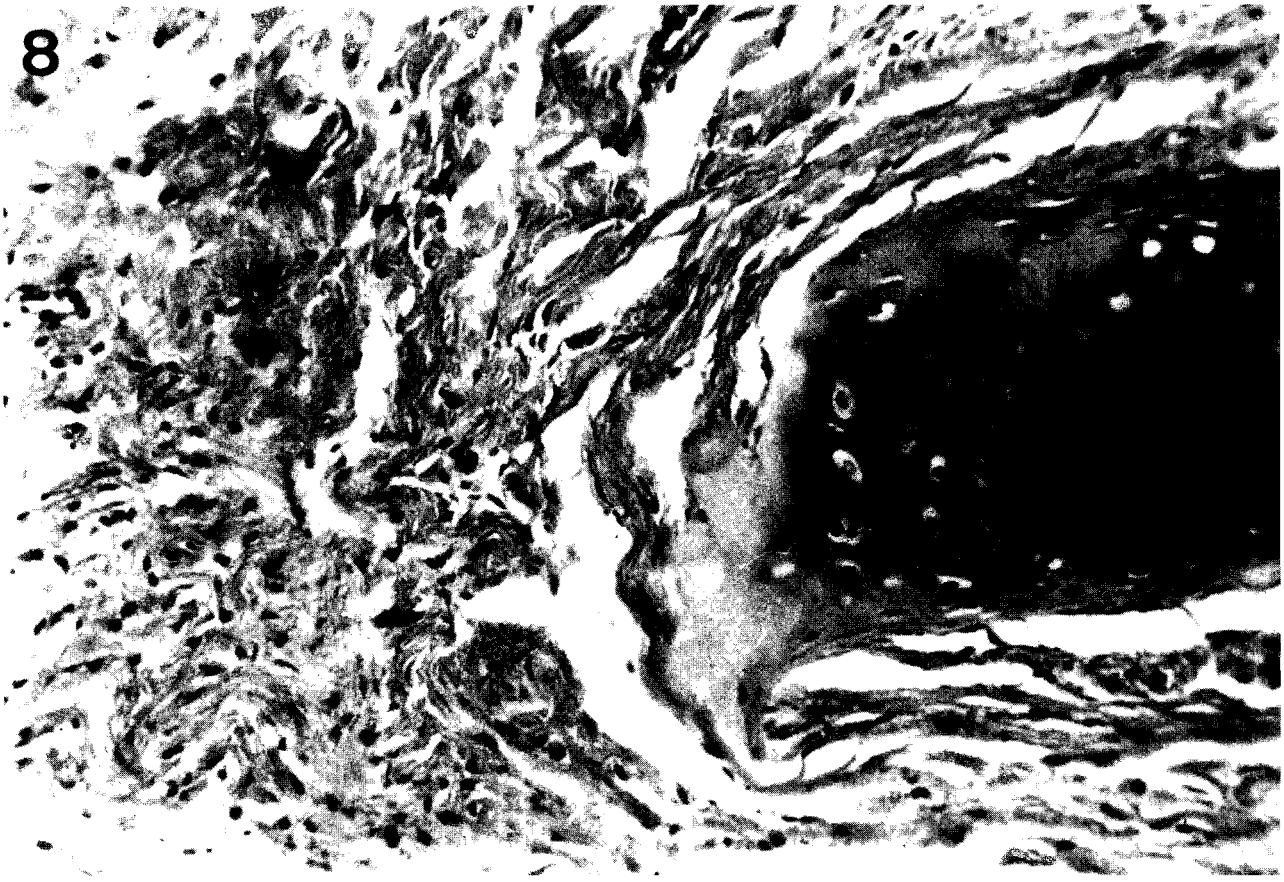

Fig. 8. Aspect of the vitality of the sectioned distal fragment of the cartilage. × 320

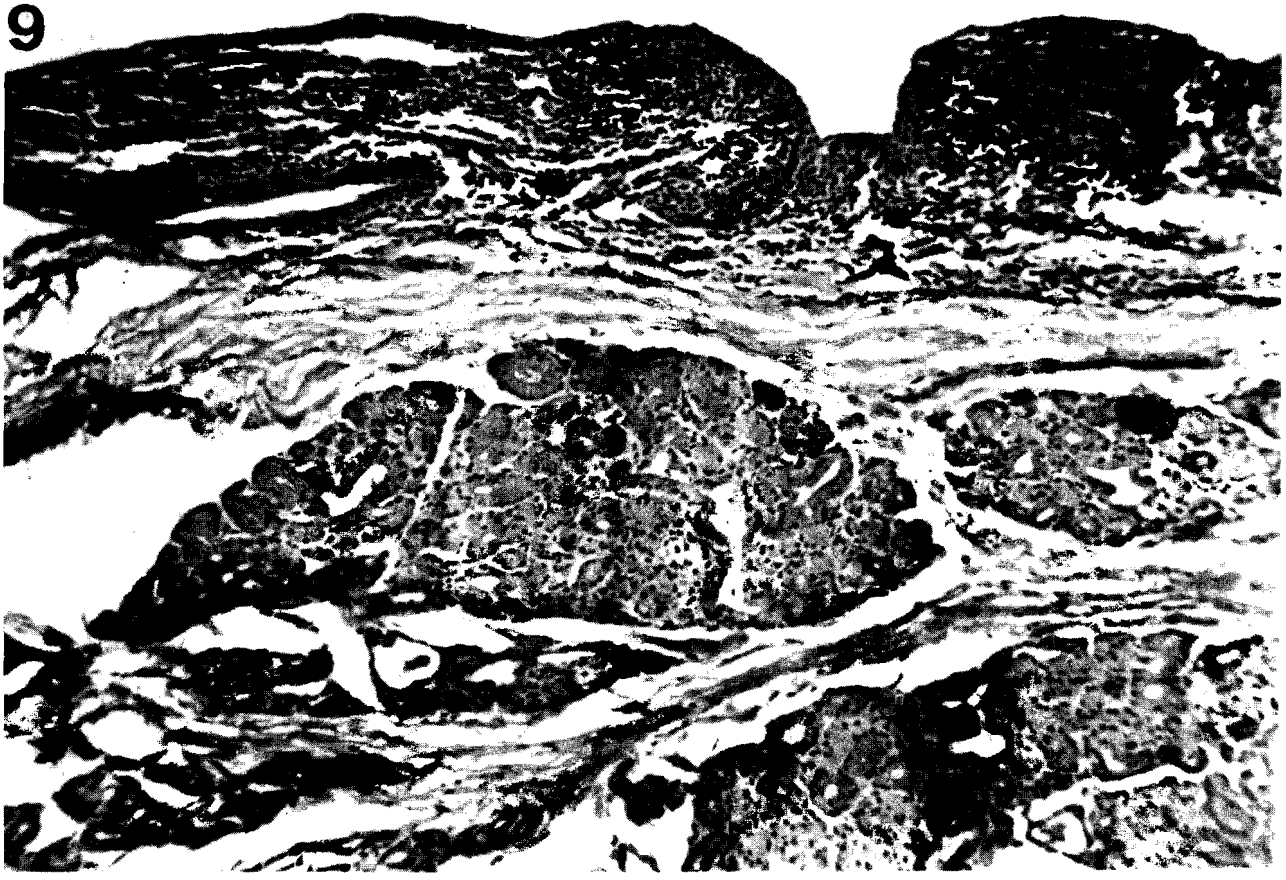

Fig. 9. Hyperplasia of the lymph nodes and glandular hyperplasia in the depths of the bulbar surface. × 270

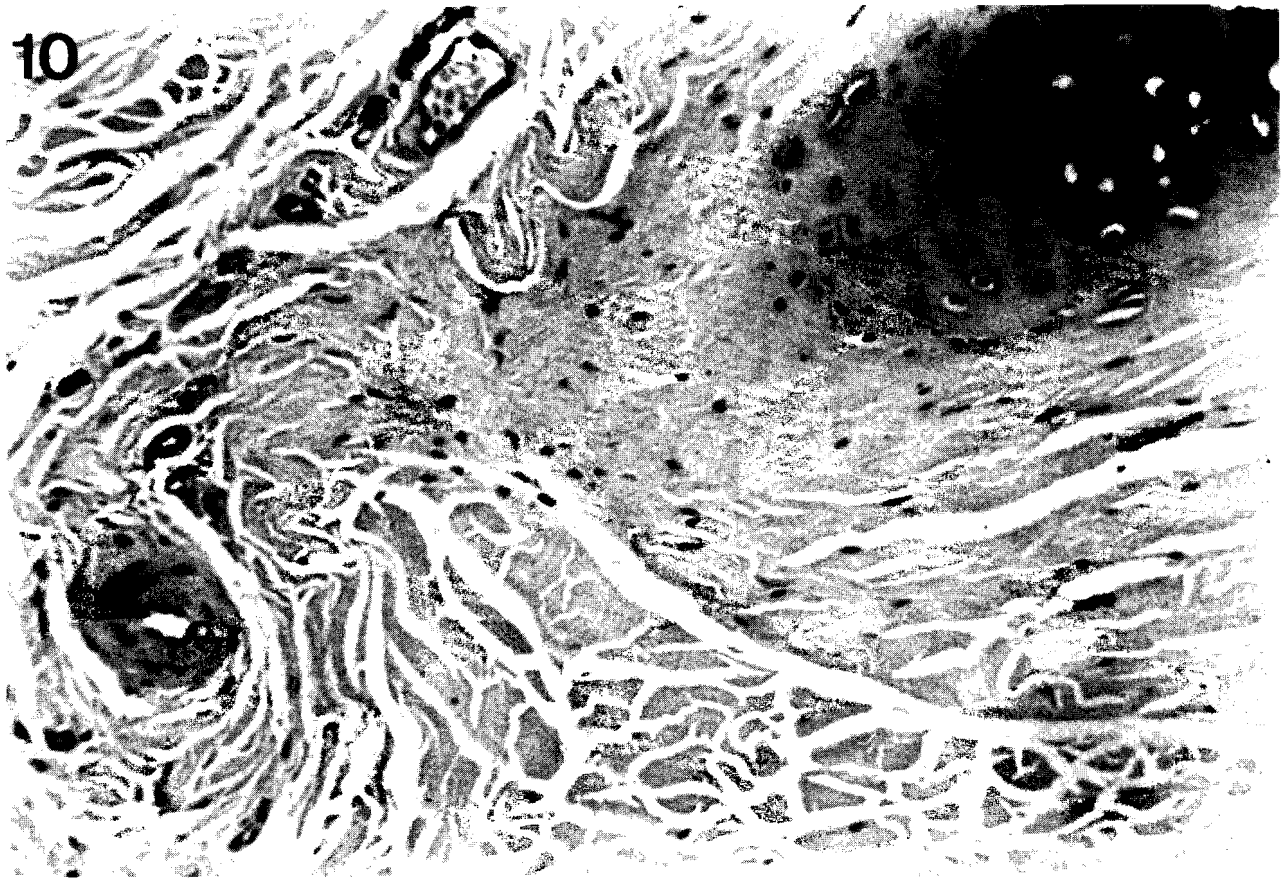

Fig. 10. Fusion between the proximal portion of the distal segment of the cartilage and the underlying connective tissue. × 270

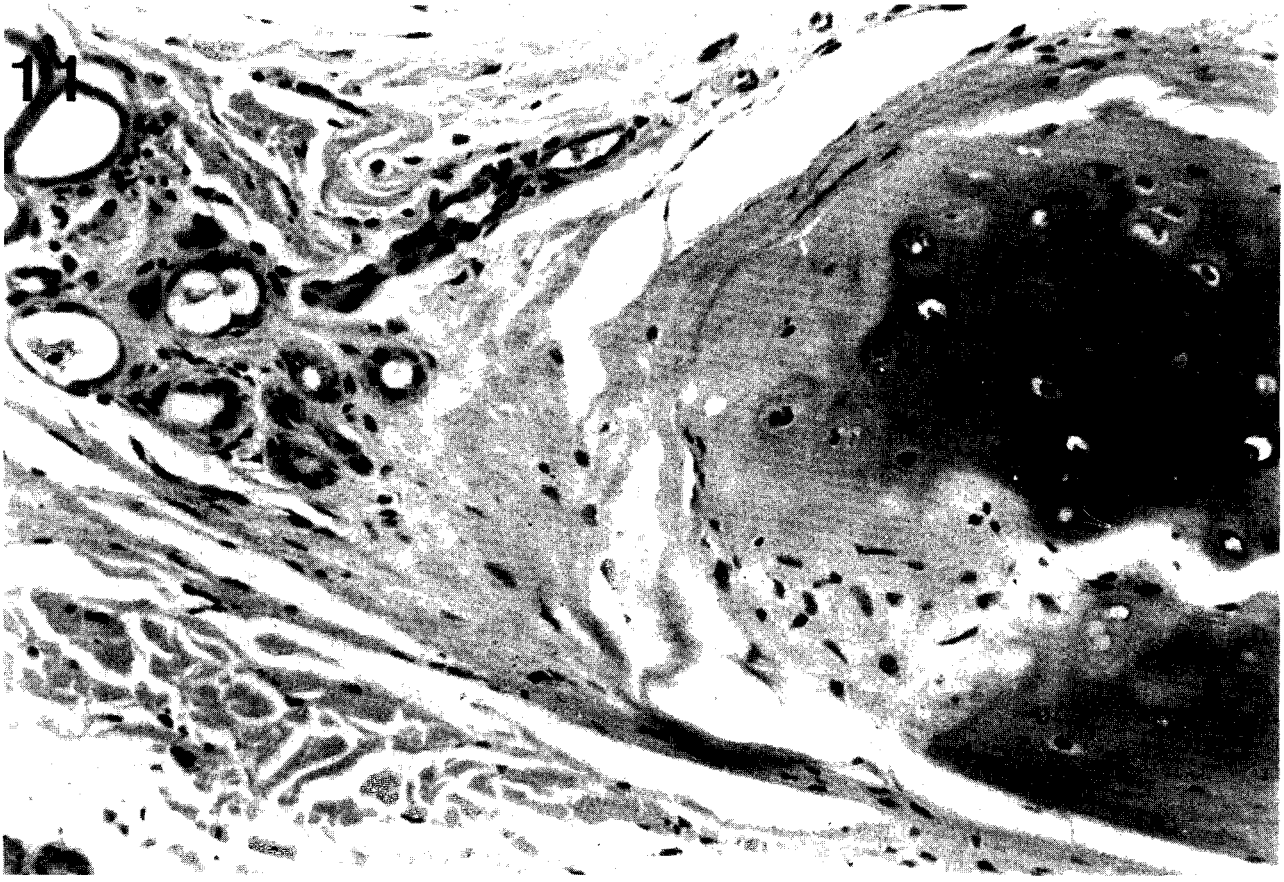

Fig. 11. Incipient necrosis and infiltration by young connective tissue of the distal portion of the proximal segment. × 270

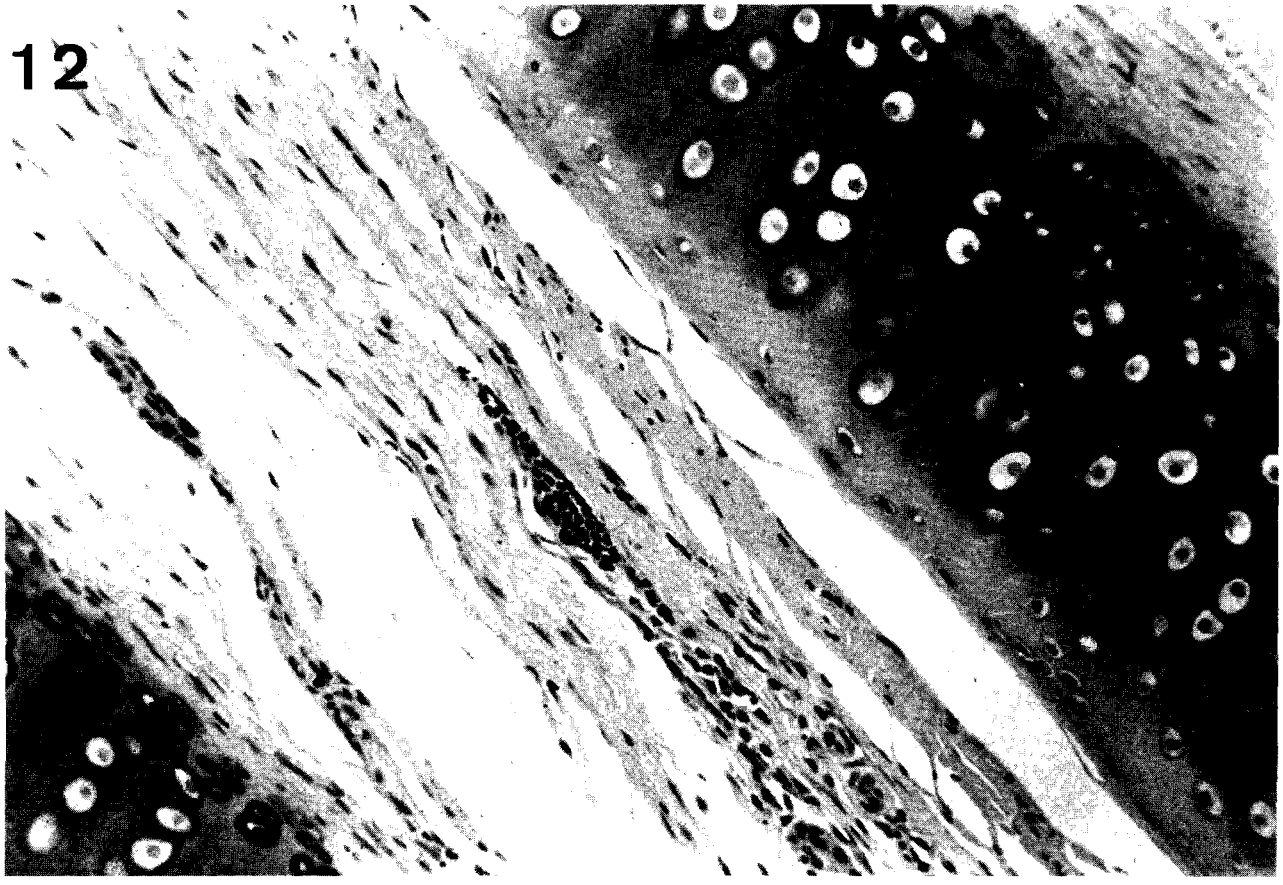

Fig. 12. Overlapping of both ends in the removal of the central portion of the third eyelid. × 320

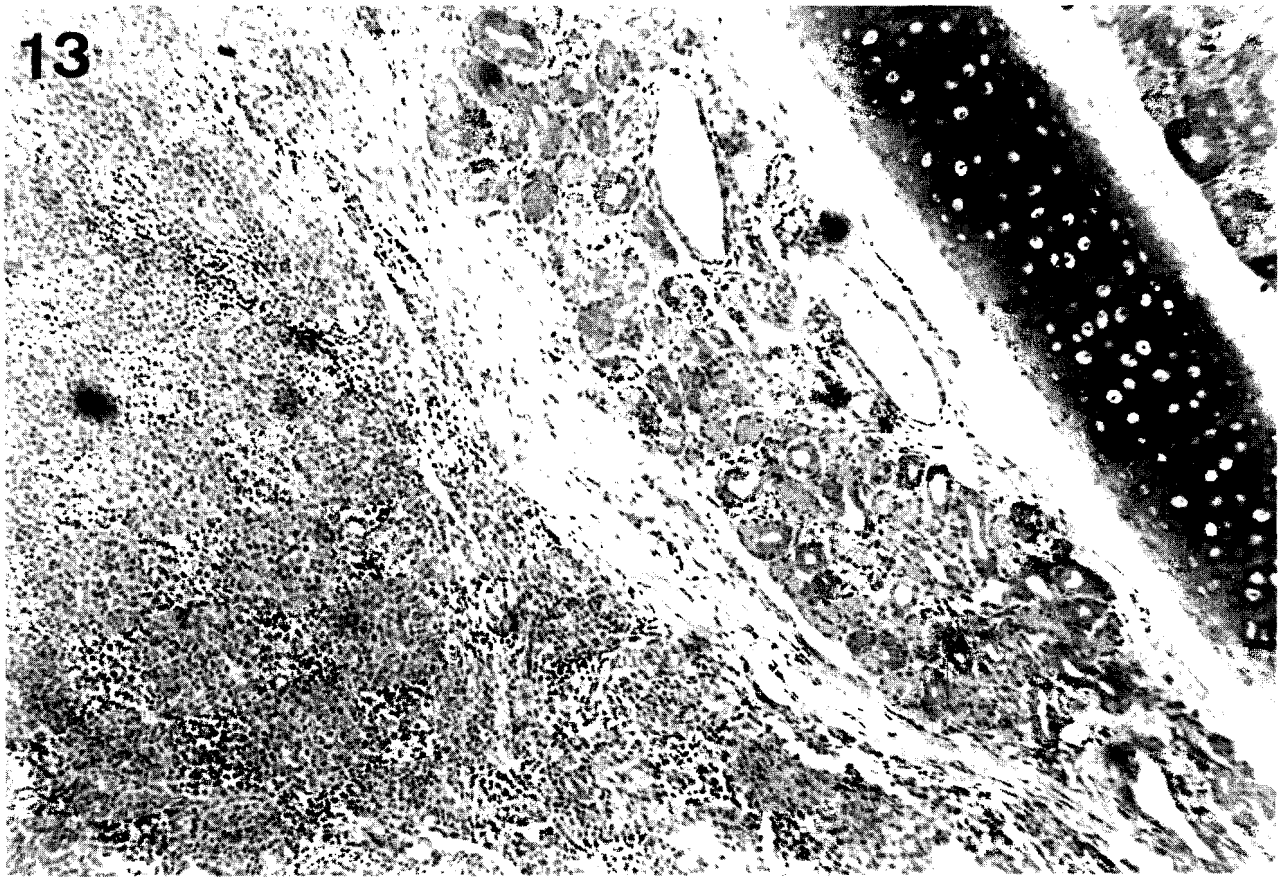

Fig. 13. Hyperplasia of the lymph nodes and local inflammatory reaction in the same case. · 120

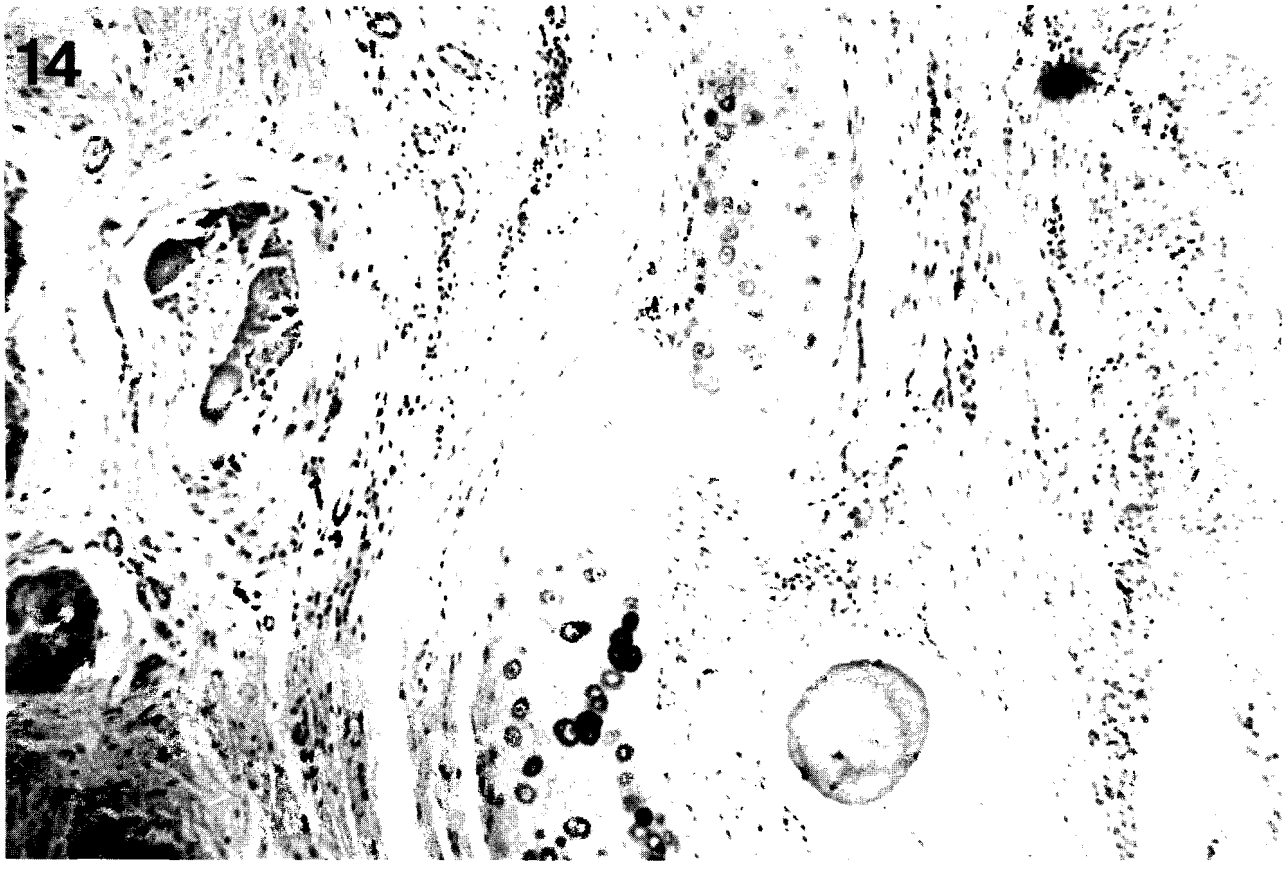

Fig. 14. Fragment of remaining suture in the homotransplantation of the third eyelid cartilage. × 120

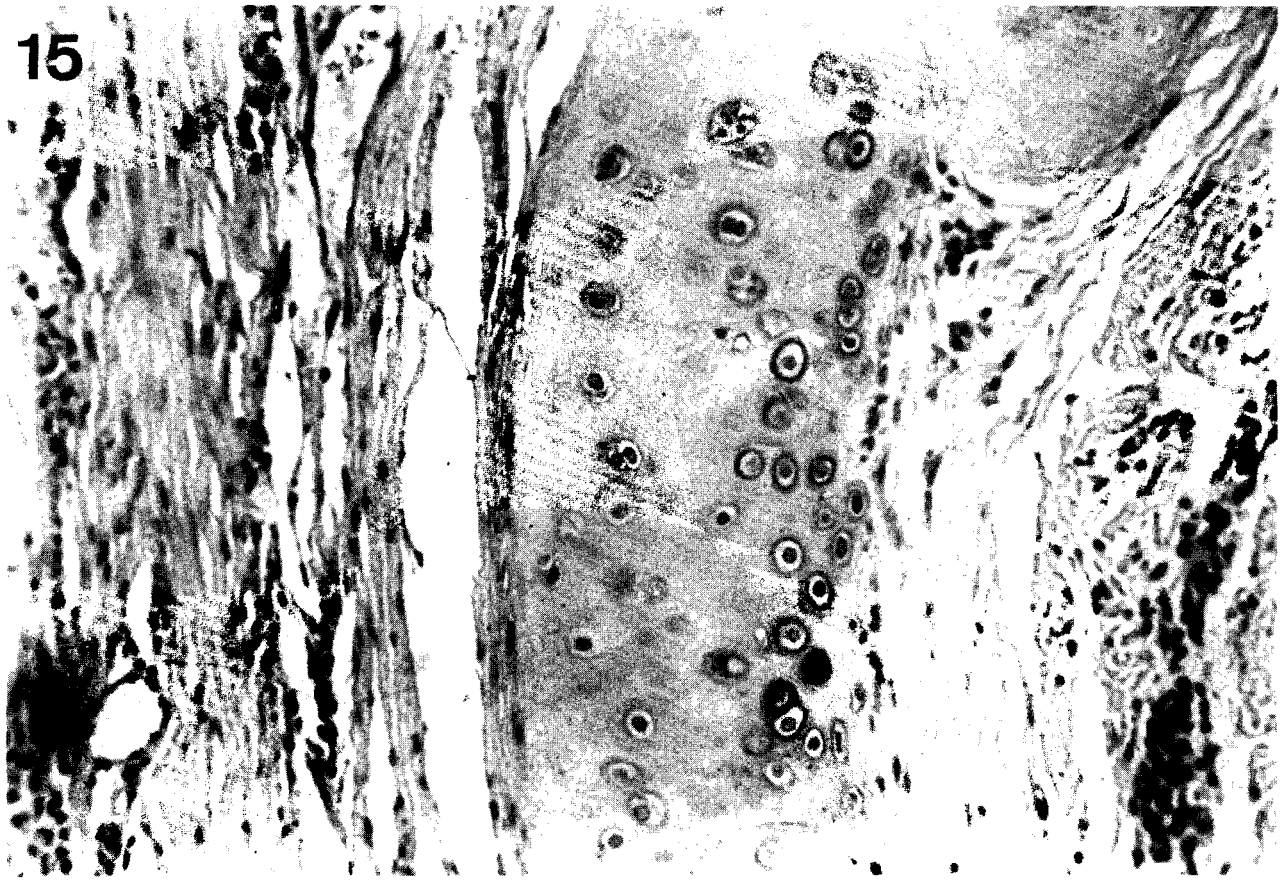

Fig. 15. Fused ends wrapped in dense connective tissue. × 270

Fig. 16. Invasion of new vessels and connective tissue in the portion of transplanted cartilage. × 270

Fig. 17. Arrangement of dense connective tissue in the outside of the transplanted cartilage. × 320

In the deepest portion of the third eyelid, at its source, the cartilaginous tissue forming the axis of the third eyelid is surrounded by a small amount of conjunctive tissue whose contexture and organisation is not modified. On both sides of this conjunctive tissue there are several seromucous glands with numerous secretory ducts and glandular acini (Fig. 3).

On both sides of the most distal portion of the globe, which is anchored to the medial portion of the cartilaginous tissue plate, there is a large quantity of conjunctive tissue which is protected by the epithelial layers of the palpebral and bulbar regions, respectively. The palpebral surface is composed of an epithelial lamina comprising the stratified smooth epithelium and a lamina propria formed by connective tissue with the same characteristics as those previously described (Fig. 4).

Where the conjunctiva of the bulbar surface protrudes there is an evident transition between the surrounding mucous membrane and the epithelial lining. Thus, the multilayered flat epithelium is replaced by another columnar prismatic epithelium rich in goblet cells. The substantia propria, or chorion, of this area is composed of connective tissue, through which runs a wide network of blood and lymph vessels (Fig. 5).

Melanic pigment cells are often found alongside the folds in the bulbar surface of the third eyelid, in the chorion and at the very base of the epithelial layer (Fig. 6).

The results obtained for surgery of the third eyelid were as follows:

1. Resection of the greater part of the third eyelid cartilage

Gross examination showed a clear shortening of the third eyelid, with progressive loss of tension as well as a certain flaccidity also evident histologically. Cut edges were seen to be coming together in some areas, even when exeresis affected 1 cm or more of the cartilage (Fig. 7).

45 days after exeresis, there was still a discrete focal inflammatory reaction in the medial part of the section and on both sides of the most distal portion of the sectioned cartilage. The ends of the sectioned cartilage protruded into the dense connective tissue at the free edges of this cartilage. The area between the free ends was similarly occupied by dense connective tissue formed by disorganised bundles of fibre. The vitality of the cartilage and the arrangement of the conjuctiva which surrounded it ensured the continuation of the sectioned distal fragment of the cartilage (Fig. 8). The young connective tissue found between the free sectioned ends was rich in cells, vessels and disorganized fibres.

Both persistent hyperplasia of the lymph nodes and glandular hyperplasia could be seen deep in the bulbar surface (Fig. 9).

The proximal portion of the distal segment of the cartilage was fused with the underlying connective tissue (Fig. 10).

The distal portion of the proximal segment (Fig. 11) showed incipient necrosis of the cartilage, being infiltrated by young connective tissue rich in cells and with a homogeneous matrix.

2. Removal of the central portion of the third eyelid

Fragmentation of the cartilage gave rise to an overlapping of both ends, resulting in a real shortening of the third eyelid. The pull resulting from this displacement of the cartilage brought about a disorganisation of the connective tissue. Signs of a local inflammatory reaction could still be seen (Fig. 12), accompanied by outstandingly clear evidence of hyperplasia of the lymph nodes, as shown in Fig. 13.

3. Homotransplantation of the third eyelid cartilage

This group of animals underwent exeresis of 1 or 2 cms of cartilage, followed by transplantation of a similarly-sized piece of cartilage. 45 days later, histological analysis revealed complete union between the ends of the donor and receptor cartilages.

The surgical technique employed and the placing of sutures allowed the fusion of the edges of the transplanted cartilage with the remaining parts of the original cartilage, due to the proliferation of dense connective tissue between them. This tissue, scarce in cells and rich in fibre, was similar to that which would normally have been found in the pre-existing cartilage portion. In some instances sutures were absorbed, while in others they remained, but in neither case was there any evidence of reaction as a result of their implantation in the connective tissue (Fig. 14).

It is particularly noteworthy that the loss of basophilia in the amorphous matrix of the transplanted piece of cartilage was apparently not accompanied by loss of texture, as the chondrocyte groups remained visible and closely-grouped, and only the basophilia of the amorphous basic substance was modified.

In some of the sections taken at 45 days after transplantation, there seemed to be a continuity betweeen the transplanted section and the original portion. There was an apparent fusion of both ends, evident in the loss of chondrocyte cells, together with a homogenisation of the entire matrix. These fused ends were wrapped in dense connective tissue rich in fibroblasts and interspersed with rounded cells (Fig. 15).

In the sectioned part of the original cartilage, evidence was found of devitalisation of the cartilage tissue, together with a progressive loss of chondrocytes leading to empty chondroplast cavities. 'There was also loss of basophilia in the basic amorphous substance, which only persisted in its central portions. In the portion of transplanted cartilage there was an invasion of new vessels and connective tissue which revealed large numbers of fibroblasts and some macrophages (Fig. 16).

On the outside surface of the transplanted cartilage there was a close arrangement of dense connective tissue (Fig. 17).

Discussion

Gross comparison of the results obtained from the various surgical techniques reveals various degrees of success. The best results were obtained from the homotransplantation of the cartilage, since the third eyelid retained its original shape and its perfect fit with the cornea. Resection of the central portion of the cartilage led to a loss of tension in the third eyelid, and thus a less perfect fit with the corneal surface. This loss of tension was even more evident on resection of most of the third eyelid cartilage (Mañé et al., 1988).

These results are confirmed by the microscopic data, which showed a shortening of the third eyelid due to the drawing together of the sectioned edges (when most of the third eyelid cartilage was resected) or due to the overlapping of these edges (in cases where the central portion of the cartilage was removed).

However, the best morphofunctional fit was observed in those animals receiving cartilage transplantation, since joining of the transplanted cartilage and the ends of the resected cartilage was achieved, thus retaining the original length of the cartilage.

References

Cottrell B. and Peiffer R.L. (1989). Abnormal appearance (Third eyelid). In: Small animal ophtalmology: A problem-oriented approach. Peiffer R.L. (ed). Saunders. Philadelphia. pp 156-161.

Dyce K.M., Sack W.O. and Wensing C.J.G. (1987). Textbook of veterinary anatomy. Saunders. Philadelphia.

Gelatt K.N. (1972). Surgical correction of everted nictitating membrane in the dog. Vet. Med. Small Anim. Clin. 67, 291-292.

Helper L.C. (1975). The membrane nictitans: other technics. In: Current techniques in small animal surgery. Bojrab M.J. (ed). Lea & Febiger. Philadelphia. pp 32-34.

Helper L.C. (1981). The canine nictitating membrane and conjunctiva. In: Veterinary ophtalmology. Gelatt K.N. (ed). Lea & Febiger. Philadelphia. pp 330-342.

Magrane W.G. (1973). Ophtalmologie canine. 10ª ed. Maloine ed., Paris.

Mañé M.C., Usón J., Vives M.A. and Leuza A. (1988). El homotrasplante del cartílago del tercer párpado frente a otras técnicas quirúrgicas de resolución de la eversión del tercer párpado en el perro. Cir. Vet. Mex. 1, 8-19.

Peiffer R.L. and Harling D.E. (1985). Third eyelid. In: Textbook of small animal surgery. Slatter D.H. (ed). Saunders. Philadelphia. pp 1501-1509.

Sisson S. and Grossman J.D. (1974). Anatomía de los animales domésticos. 4ª ed. Salvat. Barcelona.

Slatter D.H. (1981). Fundamentals of veterinary ophtalmology. Saunders. Philadelphia.

Usón J., Mañé M.C., Bonafonte J.I., San Román F. and Vives M.A. (1982). Trasplante del cartílago del tercer párpado en el perro. Avepa 5, 31-33.

Accepted April 20, 1990