Chapter XIX

Early Therapeutic and Diagnostic Contact Devices

Introduction

Application	**Authors**
Mechanical action	
Opistoblefaros	Albini (1870)
Ablepharon	Müller Brothers (1887)
Symblepharon	Panas (1888), de Wecker (1889), Hanke (1916), Wessely & Salzer (1916), Majewski (1916), Jllig (1917), Carsten (1917)
Corneal reshaping	Panas (1888), Weihmann (1920), Meyerbach (1926), Ball (1851),
Corneal graft	Wecker (1889), Strampelli (1921),
Reservoir of Medication	
Soft devices	Houdé (1885), Galezowski (1885-1887), Mules (1894)
Protection against radiations	
In aniridia	Pichler (1918)
Ionizing radiation	Wölffling (1919/32)
Diagnostic purposes	
Radiology	Chevallereau (1911), Wessely (1916), Engelbrecht (1918),
Gonioscopy and examination of the ocular fundus	Salzman (1914/15), Koeppe (1915/20)

Table 19 - 1
A selection of early contact devices for therapeutic and diagnostic use.

Even if contact devices for diagnostic and therapeutic purposes do not fit in with the usual definition of contact lenses, it impossible to disregard them without mention, because the history of these devices has evolved in parallel with contact lenses and contact shells. This chapter presents some examples of the use of contact devices for therapeutic and diagnostic use, while citing those that seem to be the most typical of and significant for the epochs concerned.

From the most ancient of times, courageous or intrepid “medicine men”, oculists and physicians have risked putting various products and devices into the eye with the aim of either protection or cure. Before the discovery of local anesthesia by *Koller* in 1884, the success of these initiatives was unpredictable and the long-term maintenance of cure doubtful. In this chapter, we will describe certain contact devices that have profoundly influenced the history of contact lenses. The choice of citations has been conditioned by the reverberation they had during the time in which they were written, rather than by how effective they were or in terms of their immediate or late success.

Figure 19-1
The eye of "Le Scribe Accroupi" (the Squatting Scribe) of the Louvre in Paris.
The eye inserted into the orbit of the "squatting scribe" of the Louvre Museum in Paris allows us to understand the mechanism of this expressive "eye-following illusion".

Ocular Prostheses

The most primitive contact devices took their inspiration from ocular prostheses and even from pieces of jewelry that the artists encased in

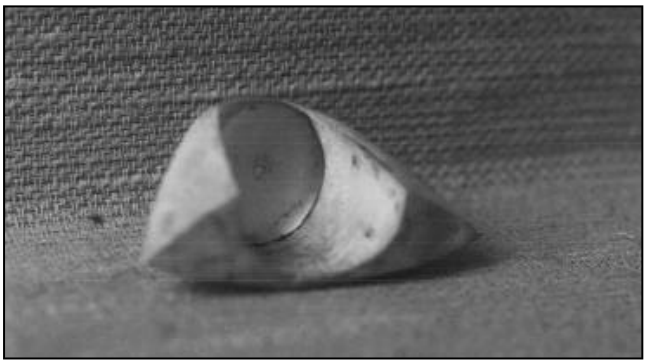


Figure 19-2
Upper view of an artificial eye from a statue of Ancient Egypt
The study of an artificial "eye" (Reserve Eye # E3009 at the Louvre Museum, Paris) allows us to understand the "eye-following illusion". A plano-convex lens made of quartz is embedded from behind in an alabaster "sclera". The tunnel that served for the introduction of the lens is lined with resin. As a result, the eye is surrounded by an encirclement of copper and is fixed in the orbit of the statue's head.
The depth and the refractive power of the quartz lens gives rise to the impression of an eye's "anterior chamber". The posterior surface of the lens is painted as an iris and has in its center a small "pupillary" excavation filled with black resin. The alabaster "sclera" encroaches on and partially covers the anterior periphery of the quartz lens, thereby creating a "limbus". The effect of the shadow from this accentuates the impression of 3-dimensional relief of the anterior chamber and creates the "eye-following illusion".

plaster in the orbits of statues to give these a more impressive “look”. The example of the statues of ancient Egypt is often cited. (1) It is likely that these objects made from rock crystal, glass, painted stone or silver gave a gross imitation of the appearance of an eye and were also used to replace an enucleated eye. *Ambroise Paré* described artificial eyes made from enameled gold, while *Fabricius of Aquapendente* described those glass eyes that were manufactured in Venice. Enamellers and manufacturers of “crystal eyes” were also found in Holland, Paris and Prague.

In the 17th Century, Paris witnessed a succession of several “eye-enameling craftsmen” famous for the manufacture of artificial eyes. At the beginning of the following Century, the best known of the professional enamellers was *Charles-François Hazard-Miraud,* who became famous “because he was the first to make a cornea that was transparent, attractive and striking as it was separated by a real anterior chamber from the iris”. Contrary to those of their predecessors, the so-called “Parisian glass-eyes” were formed from two layers: first an anterior frontal layer, the transparent center of which simulated the cornea and the opaque periphery the sclera, and secondly a posterior layer that was in contact with the orbital conjunctiva. The free space left between the two layers lightened the prosthesis and gave it the effect of depth and relief. The “Parisian prosthesis” and the procedure associated with its manufacture permitted also placing prosthesis on a phthisical eye or covering an eye that had either been disfigured by a nebula or a corneal ectasia. This was achieved by adjusting the depth of the posterior layer or conserving only the anterior layers.

This technical expertise of manufacture contrasted with that of foreign prostheses that were made out of one piece solely, either from enameled metal or varnished ceramic. The art of manufacturing artificial eyes of quality remained the monopoly of the Parisian ocularists for two hundred years. *Desjardin* and *Boissoneau* were the two most illustrious members of this group. Their exclusivity was lost in the middle of the 19th Century when the fabrication of artificial glass eyes was introduced into Prague and Thuringia (Germany). In this last region, the community of the small town Lauscha, that was up till that time specialized in ordinary glass manufacture, found a new outlet in the manufacture of glass ocular prostheses (2). Lauscha was the cradle of manufacturers of glass eyes bearing the name of *Müller,* several of whose descendants emigrated from Lauscha in the 19th Century, some of them to Wiesbaden (*F. Adolf Müller & Sons*), others to Berlin (*Müller-Uri*) and the lasts to Stuttgart (*Müller-Welt*), where they became famous for the manufacture of ocular prostheses and contact shells.

1 – Contact Devices with a Mechanical Effect

1.1. – The “0pistoblefari” of Albini (1870) *(Appendix19 – 1)*

In 1870, *Albini,* Professor of Physiology and Lecturer in Ophthalmology at the University of Naples, described under the title, *“**Gli Opistoblefari**” (On devices behind the eyelids)* the reduction in size by compression of a corneal staphyloma using an aluminum shell placed behind the eyelids and applying pressure on the sick eye. (3):

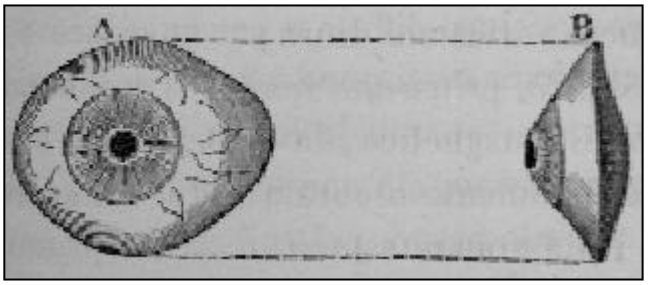


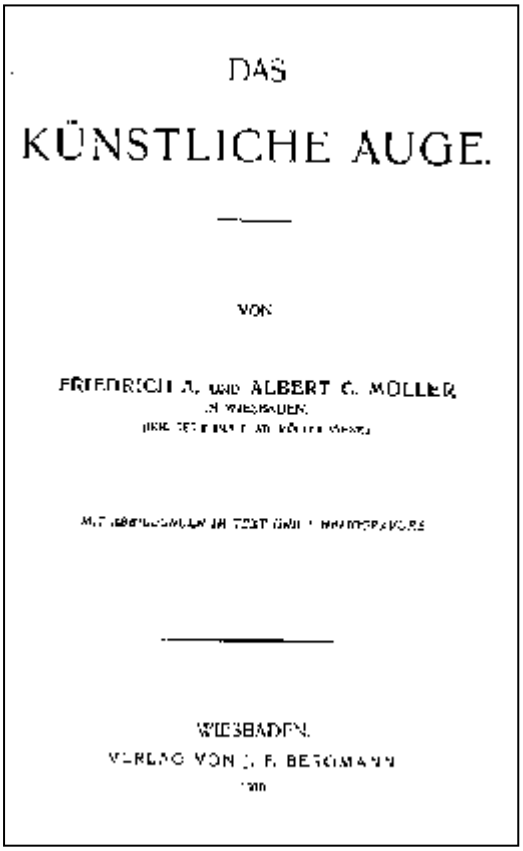
Figure 19-3
The "opistoblefaros" of Albini (1870).
Frontal (A) and lateral view (B) of an "opistoblefaros" for the right eye. In 1870, Guiseppe Albini of Naples successfully used "opistoblefari" for compression of a corneal staphyloma He described the possibility of mounting a lens in the center of the "opistoblefaros" and constructing therefrom a contact device in order to correct vision as a substitute for spectacle glasses.
(Albini, Guieppe, "Gli Opistoblefari", Rendiconto dell'Accademia delle Scienze Fisiche e Matematiche, Società reale di Napoli, 9, 1870, fig. p. 193)

“*little metallic plaques modeled on the visible anterior part of the eye, introduced behind the eyelids in order to apply uniform pressure on the ocular globe, with the help of a bandage applied over the closed lids, in order to restore the physiologic shape in the common situation where it is altered, as, for example, in the various forms of staphyloma, ectasia of the cornea, etc.”* (4)

For the manufacture of the “*opistoblefari”, Albini* considered the use of various metals such as gold, platinum and lead, choosing finally aluminum “*which, by virtue of its lightness, its malleability and its grade of hardness is more suited to the application than other materials.”* (5)

Encouraged by this success, *Albini* thought of other applications for the “opistoblefaros” such as protection of the eye and the application of various therapeutic agents to the cornea. He reported having utilized the “opistoblefaros” as an alternative to stenopeic glasses, after having perforated an aperture opposite that part of a cornea remaining transparent, the remainder being partially opacified by a corneal scar. The perforated shell was intended to adapt perfectly to the eye, all the movements of which it followed, so much so that the aperture of the “opistoblefaros” was always opposite the transparent part of the cornea. Using the experience acquired as a basis, *Albini* also proposed that aluminum shells be used for the prevention of symblepharon in patients with burns caused by caustic agents in order to protect the eye from pressure from the eyelids when corneal ulcers were present and to use them also as an electrode in order to induce electric currents in the eye. The most interesting proposal was to encase in the aluminum shell a quartz lens of suitable convexity: *“These ‘opistoblefari’ would replace glasses […] by encasing in their opening a quartz lens of various degrees of convexity or concavity “* (6) This suggestion therefore conjures up the idea of an optical contact device that was used to replace spectacle glasses. It is improbable that *Albini* carried out his experiments with such an intention. The manufacture of an aluminum shell with a corrective lens would not have been straightforward and the tolerance of this would have been very dubious in the absence of local anesthesia. (7)

1.2 The Protective Shells (Schutzschalen) of Müller-Brothers of Wiesbaden (1887) *(Appendix 19 – 2)*


DAS

KÜNSTLICHE AUGE.

VON

FRIEDRICH A. UND ALBERT C. MÜLLER

WIESBADEN.

VERLAG VON J. F. BERGMANN

Figure 19-4
Title page of the brochure "Das künstliche Auge" (The artificial Eye) of the Brothers Friedrich A. & Albert C. Müller of Wiesbaden (1910).
In this brochure, dedicated as it was to ocular prostheses, the Müller Brothers, Friedrich A. and Albert C. described the use of blown glass shells for the protection of the eye of a patient whose eyelid had been destroyed by carcinoma. This brochure does not mention the use of shells for their refractive effect.

In a brochure published in 1910 with the title ***"Das künstliche Auge"*** *(The artificial Eye),* the ocularists *F.A. & A.C. Müller Brothers* of Wiesbaden reported that their enterprise had supplied a blown-glass "protective shell" (Schutzschale) to Professor *Sämisch* of Bonn. This shell was equipped with a transparent cornea for the only eye of a patient who was suffering from lagophthalmos, whose eyelids had been destroyed by carcinoma. This "capsule" (Kapsel) was probably cut out of the frontal layer of an ocular prosthesis. Like these last ones, it had a scleral zone that was milky white in color with "conjunctival vessels" painted on it and a corneal zone that was left transparent and without real optical effect. According to the *Müller Brothers* the shell was applied to a functionally only eye, the other eye being amblyopic by reason of high myopia and a cataract. The shell had been worn for more than 20 years:

"In 1887, Councillor Sämisch sent us a patient whose right eye had been totally exposed inferiorly, in view of the fact that the lower eyelid had been completely destroyed by carcinoma and was non-existent as far as the orbital border. At the upper eyelid, the temporal part was missing, whereas the remainder had been hardened by entropion and trichiasis. The insertion of a capsule (Kapsel) was intended to protect the globe against air and prevent the progression of corneal desiccation, the epithelium of which was already in a state of necrotic destruction […]. For this reason, we decided to produce a shell with a transparent cornea that would cover the globe like a thin prosthesis. […] Therefore, we manufactured the necessary shell. The patient wore it from that time, continuously, day and night. (8)

According to the "Inaugural-Dissertation" thesis for M.D. defended by *F.E. Müller* in 1920, the *Müller Brothers* also supplied a similar shell in 1892 for another female patient who was affected by entropion and trichiasis. (9) :

"In 1892, a female patient of Dr. Fränkel in Chemnitz received a contact shell for the protection of his right eye against lesions resulting from incurable entropion and trichiasis; she tolerated the shell on a long term basis without any problems." (10)

1.3. – Devices for the Prevention of Symblepharon

The idea of inserting a device that was more or less rigid between the palpebral and bulbar layers of conjunctiva in order to prevent synechiae occurring during scarring is

not new. Thus it was that, since the 16th Century at least, there have been attempts to protect the globe and separate the two conjunctival layers mechanically for the purpose of prevention in the case of a chemical burn or as curative treatment associated with the surgical management of symblepharon. *Bartisch* described thus the treatment of symblepharon and of ankyloblepharon in 1583 in his treatise "***Ophthalmodouleia"***, in which he advised that a layer of lead smeared with rose oil be inserted between the eyelids and the eye:

"Then take a piece of lead that has never been used. Beat it out thin and lay it between the two lids on the eye. The part or side of the piece of lead which comes into contact with the eye should be coated with rose oil." (11)

In 1857, the "***Traité pratique des maladies de l'œil****" (Practical Treatise on Eye Diseases)* of *Mackenzie* (in its revised and completed French version by *E. Warlemont* and *Testelin),* indicated that scarring after the operation for symblepharon would be ameliorated by "the insertion of one of the foreign bodies listed above, that of an artificial eye for example" (12). Those authors who had previously recommended the interposition of shells made from different materials were also listed:

"The interposition of foreign bodies between the eyelids and the eyeball, like blades of lead (Bartisch), a piece of bladder (Callisen) or parchment (Solingen), a wax shell (Rosas), an artificial eye soaked in sweet almond oil (Demours), an ivory shell previously softened in hydrochloric acid (Carron du Villards)." (13)

According to *Duke-Elder*, *White Cooper* suggested the insertion of a glass shell in order to prevent symblepharon:

"*Apart from the suggestion of William White Cooper (1859) that symblepharon after a lime burn might be prevented by placing a "glass mask" in the eye and filling the fornices, there is no record of any attempt to put this idea into practice until more than 60 years had passed."* (14)

Rosmini (1887), Panas (1888), de Wecker (1889), Poley (1889)

In 1887, *Rosmini* described in Turin his favorable impressions of small glass shells in the management of symblepharon to the meeting of the Italian Society of Ophthalmology. He quoted de *Wecker*, who had also been using these shells. In the discussion, an attendee reminded him that *Albini* had recommended the same management, but had not had the success he had hoped for. Another attendee thought that the irritation produced by the shell would encourage extension of the symblepharon.

In a communication in 1888 to the French Academy of Medicine (15) on the ***"Traitement optique du Kératocône"*** *(Optical Treatment of Keratoconus), Panas* referred to shells used for the treatment of symblepharon. In 1889, *de Wecker* (Paris) declared also that he had been making use of glass shells for the prevention of symblepharon: "*What I recommend as being of practical use, […] for conjunctival grafting in symblepharon, etc., is the interposition of glass shells between the eyelids, like the ones we have been using in our clinic for many years*" (16). In the same year, *Poley* also recommended ocular prostheses in an article entitled, ***"The uses of an artificial eye-shell for operative and other purpose".***

Hanke, Wessely, Salzer (1916)

At the time of the discussion of a communication on symblepharon to the Congress of the German Ophthalmological Society, *Hanke* (Vienna) indicated that "*when significant*

synechiae remain between the conjunctiva and the eyelids, after you have plucked out and removed the cicatrices", he placed there "*transparent shells that are equipped with a little tube which leads towards the interior. This has the advantage that you can easily irrigate the wound and, if you reckon that the shells are transparent, you can observe the wound well.*" (17) In the same year, *Wessely* (Würzburg) recommended placing "*glass prostheses in the conjunctival cul-de-sac*". *Salzer* (Munich) confirmed the benefit of this approach. (18)

Majewski (1916)

In 1916, *Majewski* (Cracow) described the use of shells and prostheses made of glass with the purpose of preventing cicatricial shrinkage of orbital tissues after enucleation: "*In cases of shrinkage or total scarring of the orbital cavities […] he forcibly introduced into the cavity a sterilized prosthesis, i.e. a prosthesis that had been freshly boiled.*" (19)

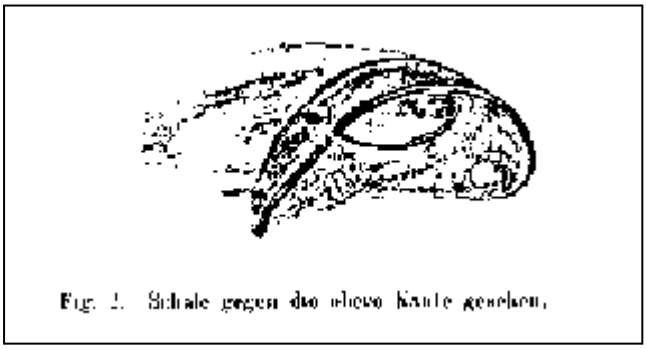


Figure 19-5
Jllig's shell (frontal/postero-anterior and three quarters lateral views) (1917).
Jllig's shell for the prevention of symblepharon was manufactured from transparent glass starting with the frontal layer of a blown glass shell. It consisted of the scleral zone only. A "corneal aperture" (Hornhautloch) in the center permitted inspection of the corneal wound and dressing. Illig's shell was manufactured by Müller Brothers (Wiesbaden) and was available in 10 diameters and curvatures.
(Jllig, Heinrich: "Eine Glasschale zur Verhütung und Behandlung des Symblepharon, zugleich ein operationstechnisches Hilfsmittel bei Lid- und Bulbus-Verletzungen", Archiv für Augenheilkunde, 1917, 82, Tafel V, fig. 1 & 2).

Jllig / Carsten (1917)

In 1917, *Jllig* (Munich) described eleven cases of the application of glass shells made by *Müller Brothers* (Wiesbaden) that were slipped between the eyelids and the eye with the intention to prevent symblepharon and manage it, if necessary. The *Jllig* shells were unusual in that they had a central opening opposite the cornea and they were also provided with small orifices in their scleral portions. They were available in sets of 10 with different diameters and radii of curvature. It was recommended to sterililize (sic) them by boiling before use:

"We asked the firm F. Ad. Müller & Sons of Wiesbaden to provide us with glass shells which, being supported between the eyelid and the ocular globe, are intended to prevent the formation of synechiae between eyelid and eyeball. These shells are shaped like cupulas, with their radii of curvature corresponding more or less with the radius of curvature of the globe of the eye; in the center of the ocular portion of these shells, there is an orifice, the diameter of which is slightly larger than that of the cornea itself. At the side of the shell small orifices (vents) can be added " (20)

Carsten (Berlin) confirmed that he used these shells with central apertures as recommended by *Jllig* , with the reservation that they were taken out each day for cleaning and removal of secretions. (21)

1.4 – Compressive Devices for Corneal Reshaping

Corneal Reshaping by Transpalpebral Compression

The idea of corneal reshaping went back to *Purkinje*, who tried to reduce his own myopia by the nightly application of small bags filled with iron (22). In 1851, *Ball* of New York City succeeded in being awarded a patent for a "Patent Eye-Cup" that he claimed would

reduce myopia by a compressive effect (*Ferry*, 2004). Although the effect of topical anesthesia by cocaine was only discovered in 1884, *Albini* reported in 1870 how he reduced a marginal staphyloma with his own "opistoblefaros" placed directly on his eye.

Panas / Kalt (1888)

In 1885, *Panas* published successful therapeutic treatment of a case of keratoconus that he treated by nightly transpalpebral compression by means of a mold with dressings and instillation of eserine. (23) Convinced of the efficacy of treatment by compression, *Panas*, in 1888, attributed the visual improvement obtained with the early contact shells by his assistant *Kalt*, to their reshaping effect:

"The cornea, being very thin, molds itself exactly in their concavity and is reshaped as a result. If the curvature of the glass is well chosen, you can achieve a state close to emmetropia and, more importantly, there is improvement across the whole of the visual field." (24)

Later, many authors noted several cases of "regression" of keratoconus under contact lenses and contact shells that were sometimes significant and expressed the hope of a possible cure for corneal ectasias. Others, for instance *Siegrist* (Berne) were wary of the same corneal reshaping effect, fearing that it might indicate compression of the globe that could be harmful to the future of the eye.

1.5 – Rigid Contact Shells for the Maintenance of a Corneal Graft

De Wecker (1889)

In 1889, in a communication to the *Paris Society of Ophthalmology, de Wecker* presented a young patient on whose he had grafted a rabbit's cornea. In order to hold this graft in place, he had used a glass shell that he left in position without incident for 18 days:

"I chose one from amongst my very fine and transparent shells that fitted the young patient's right globe perfectly and without allowing the insinuation of air bubbles. […] I applied the glass shell which fitted marvelously, holding the graft in exactly the correct position." (25)

In the course of the discussion, *Grandmont* attributed to "*Desmarres senior*" the priority of the first application of glass shells to the ocular globe in order to retain a graft in position. In his response, *de Wecker* had to admit that the use of glass shells in ophthalmology goes back to ancient times:

" I must ask you to note that I have not the very least intention in the world to claim for myself the priority in the use of shells made of thin transparent glass, the use of which probably goes back even to Demarres's father's time (26) *What I do claim is the interposition between the lids of similar glass shells for the corneal graft. We have been using this for a considerable time at our clinic."* (27)

2 Early Contact Devices used as Drug Dispenser

2.1 – Soft Devices used as Medication Reservoirs

The medical literature at the end of the 19th Century included several therapeutic attempts to use soft contact devices placed on the eye. In 1885, a Paris pharmacist *Houdé* was selling anesthetizing gelatin inserts. Between 1885 and 1887, *Xavier Galezowski* used sheets made of gelatin and impregnated with antiseptics for the treatment of the corneal incision wound after cataract extraction. In 1894, *Mules* published his results on the use of “softened iodoform wafers” that he used for the same purpose.

Houdé’s Anesthetic Gelatinous Discs (1885)

The popularization and dissemination of *Koller’s* discovery of local anesthesia in 1884 (*Heitz*, 2000) was quickly followed by the sale of products impregnated with cocaine. Thus it was that in Paris *“Houdé’*s gelatinous cocaine chlorhydrate discs” (rondelles gélatineuses au chlorhydrate de cocaïne) were sold in a measured titer of 0.50 mg, the expected advantage of which was cited by *Warlomont*:

“*Thanks to the gelatinous discs of Houdé, you can provide benefit for all patients because of this discovery, without ruining yourself and notwithstanding the high price of cocaine. This is because one disc, which is usually enough to cocainize one patient, costs only a single sou. The disc dissolves in the closed eye and nothing is lost; the entire conjunctival surface is thus bathed in a lacrimal solution from which no corner escapes.”* (28)

Galezowski’s Gelatin Discs (1885-1887)

Date	Titre
1885	" Sur l'occlusion immédiate de la plaie cornéenne avec des rondelles de gélatine, après l'extraction de la cataracte" (On immediate occlusion of the corneal wound with gelatine discs after cataract extraction) Lecture to the Academy of Medicine, Paris (Bulletin de l'Académie de médecine, 1885, 14, 1357) "Emploi des rondelles de gélatine pour l'occlusion de la plaie cornéenne après l'extraction de la cataracte" (Use of gelatine discs for closing the corneal wound after cataract extraction) (Recueil d'ophtalmologie 1885/b, 7, 577-584) "Von der Schliessung der Hornhautwunden mit Gelatinestreifen nach der Extraction des grauen Staares" (On the closure of the corneal wound by strips of gelatin after cataract extraction) (Centralblatt für praktische Augenheilkunde 1885/c, 9, 337-340)
1886	"Sur les plaies cornéennes dans l'extraction de la cataracte et sur les moyens d'en prévenir la suppuration" (Concerning the corneal wounds in cataract extraction and on the means of preventing suppuration from them). (Bulletin et Mémoires de la Société française d'Ophtalmologie 1886, 4, 217-226) "Du traitement du staphylome conique par une extraction d'un lambeau semi-lunaire de la cornée" (On the treatment of conical staphyloma by the removal of a semi-lunar fragment from the cornea). (Recueil d'Ophtalmologie 1886, 8, 330-337)
1887	"Choix de la méthode opératoire de la cataracte, moyen d'éviter les complications" (Choosing the best operation for cataract and how to avoid complications) (Bulletin et Mémoires de la Société française d'Ophtalmologie, 1887, 5, 108-113)

Table 19 - 2
Dates of the publications by Galezowski on "gelatine disks" (plaquettes gélatineuses).

In a note read on October 6, 1885 to the Paris Academy of Medicine, *Galezowski* recommended the use of gelatin discs for the closure of the corneal wound after cataract extraction. The cautious nature of the report made at the Academy session contrasts with the notoriety that *Galezowski* subsequently experienced. The Titles of the *“Lectures”* in

the Academy Bulletin actually makes only brief mention of them:

*"Mr Galezowski read a note of support for the presentation on gelatin discs which he uses in order to achieve immediate closure of the corneal wound after cataract extraction.***"** (29)

In the same month (October 1885), *Galezowski* had published a detailed description under the title, "***Emploi des rondelles de gélatine pour l'occlusion de la plaie cornéenne après l'extraction de la cataracte"*** *(Use of gelatin discs for the occlusion of the corneal wound after cataract extraction* in the *Recueil d'ophtalmologie)*.(30) We should recall that, at the time, infection of the cornea was commonplace because of the deficiency of antiseptic procedures. These procedures consisted essentially of sprinkling the eye with carbolic acid spray during and after the operation, followed by eye dressings with boric acid, carbolic acid and sublimate. *Galezowski* recommended placing a dressing of "gelatin sheet" (feuilles de gélatine) impregnated with anesthetic and antiseptic directly in contact with the corneal wound. The communication indicated good results with the first applications: 19 cataract extractions, one excision of corneal staphyloma and one corneal ulcer.

Galezowski completed these observations six months later, on the 30th of April 1886, with a communication to the 10th Congress of the French Society of Ophthalmology under the title, ***"Sur les plaies cornéennes dans l'extraction de la cataracte et sur les moyens d'en prévenir la suppuration"*** *(On corneal incisions in cataract extractions and on the means of preventing them from suppurating)* that was published in the same year in the *Bulletins et Mémoires de la Société française d'ophtalmologie*. In this article, he confirmed that antiseptic gelatin platelets avoid infection and gaping of the incision, thus preventing the risk of leakage of aqueous and infiltration of the wound by tears teaming with microbes. *Galezowski* applied sheets made from gelatine in 160 patients operated for cataract and "in a large number of eroding corneal ulcers" (dans un grand nombre d'ulcères rongeants de la cornée). Thanks to this treatment, there was no overriding or overlapping of the wound and healing occurred in the normal way:

"Today, experience was available in a large number of patients and I applied it in more than 160 cases of cataract extraction, […] in a large number of eroding corneal ulcers, either post-operative or not associated with operation and I am able to say in all sincerity that I have never seen the slightest adverse event that might have been attributed to the presence of gelatin in the interpalpebral space." (31)

In 1886, *Galezowsky* published his results in a series of twenty keratoconus operations under the title, ***" Du traitement du staphylome conique par une excision d'un lambeau semi-lunaire de la cornée"*** *(On the treatment of conical staphyloma by means of excision of a semilunar corneal fragment).* One of these patients was treated with gelatin sheets. In 1887, he presented one last communication to the French Society of Ophthalmology in regard to the use of contact gelatinous dressings under the title, ***"Choix de la méthode opératoire de la cataracte, moyens d'éviter les complications"*** *(Choice of operative method for cataract and means of avoiding complications)* dealing with the results *of* 357 cataract operations, confirming the benefits of antiseptic sheets:

"As far as dressing eyes operated for cataract is concerned, I tend to confirm the comments that I made before the Congress last year: it is that the application of gelatin plaques with antiseptic directly to the corneal wound prevents inflammatory complications and favors healing more than any other means." (32)

The spread of suturing techniques for the corneal incision (33) caused gelatin platelets

to lose their interest as a method of uniting and antiseptizing the corneal incision. Eight years after his original description *Galezowski* made no further mention of gelatin discs for wound union and antisepsis of the corneal wound. (*Galezowski*, 1893).

The "Softened Iodoform Wafers" of Mules (1894)

After that, gelatinous devices impregnated with various therapeutic products seem to have been used sporadically for the treatment of keratitis and corneal ulcers without their users making special mention of them in their publications.

Philip Henry Mules, who was an ophthalmologist at Bowdon (British Isles), became the exception when he presented a paper in August 1894 to the Eighth International Ophthalmological Congress held in Edinburgh. His paper carried the title, ***"On the rapid healing of infected corneal ulcers"***, and described the cure of twelve cases of corneal ulcer by the placement during the night of a "softened iodoform wafer", made from softened gelatin impregnated with iodoform:

"Having first anesthetized the cornea with sol: 8 per cent of cocaine for the double purpose of rendering it hygroscopic and insensitive, with a brush I lay a portion of softened iodiform (sic) wafer over the cornea, and drawing the lid from the front of the globe close the eye gently." (34)

A note described the preparation of the iodoform wafers:

"By dissolving gelatine in saturated solution of boracic acid and stirring in Iodiform (sic) reduced by trituration to an impalpable powder, then spreading over glass plates to the required thickness and allowing to dry - before use, soak for a minute or two in cold solution of boracic acid." (35)

Mules recommended covering the eye with a bandage when the patient was at home. Generally speaking, healing was complete within three days. The effects of treatment were attributed to the destruction of micro-organisms. *Mules* indicated that the rapid effects of treatment were to be attributed to the destruction of microorganisms and this had been proved in, infected erosions, corneal ulcers, corneal incisions, and even when these were complicated by exudative reactions in the anterior segment.

These *Mules*'s wafers are very similar to current drug dispenser soft contact lenses. They were the precursors of modern hydrophilic contact lenses that are impregnated with substances for medication purposes that assure continuous delivery of active product by avoiding continuous instillation that is sometimes difficult with photophobic eyes. Collagen "corneal shields" that are used today in the treatment of corneal ulceration are direct descendants of the devices of *Galezowski* and of *Mules.*

2.2. – Glass Contact Shells for the Maintenance of Therapeutic Products.

In 1870, the Neapolitan physiologist and oculist *Albini* envisaged using aluminum "Opistoblefari" in order to keep therapeutic agents in contact with the eye and "protect the eye from corneal ulceration and promote healing" (36). This idea of keeping a product in contact with the eye by means of a glass shell was taken up later by many authors.

3 – Contact Shells for the Prevention of Photophobia

A popular idea was to use contact shells for the prevention of photophobia resulting from corneal lesions secondary to keratitis. Such lesions were very common at that time when neither antibiotics nor cortico-steroids existed. The amelioration of the photophobia associated with albinism and aniridia represented another challenge for treating physicians that several of these tried to address by using tinted shells with greater or less success.

Albini (1870)
When, in 1870, the Neapolitan physiologist *Albini* described his "opistoblefari", he envisaged preventing the dazzle produced by corneal lesions using a new type of stenopeic glasses of *Donders* that were placed directly in contact with the eye. He reported having used the "opistoblefari" successfully for this indication. The perforated shell adapted itself extremely well to the eye, the movements of which it followed in such a way that the aperture in the "opistoblefaros" found itself constantly opposite the transparent part of the cornea:

"to place in the center of the plaque a hole that was a little smaller than the pupil in order thus to replace by means of this instrument the so-called 'stenopeic glasses' as recommended by the Dutch physiologist and oculist Carl Donders. These glasses are very useful for clearly visualizing tiny objects, […] in those patients in whom the cornea has retained its normal transparency in one very limited area." (37)

Fick (1887)
From the time of his first experiments, *Fick* asked *Abbe* to provide him with shells with a blackened posterior surface. (38) Most of the pioneers of contact lenses used blackened lenses for their experiments. The results of these experiments were only rarely published, because they were often disappointing by reason of the difficulty of keeping the stenopeic hole opposite that part of the cornea that remained transparent and because of the eye irritation resulting from the presence of poorly fitted contact shells.

Pichler (1918)
In 1918 and under the title of, ***"Totale Irisausreissung – Ersatz durch ein Schalenauge"*** *(Total Avulsion of the Iris – Replacement by a shell-eye), Pichler,* an ophthalmologist in Klagenfurt (Austria), reported the fitting of an iris shell in a case of aniridia resulting from trauma. The patient had been the victim of a perforating wound resulting from a projected wood splinter. After healing, total aniridia remained, as did a significant cicatricial corneal astigmatism that caused intolerably severe photophobia. The ocularist *Müller* tried out an "artificial eye" (Kunstauge) that was fitted with a "shell-diaphragm" (Schalendiaphragma). After three attempts, the glassblower succeeded in producing a shell with an ocular profile that could be fit:

"The third artificial eye was much more suitable, the patient eventually seeing 6/12 […]. The photophobia had significantly diminished and no longer appeared except in streets that were excessively brightly lit." (39)

4 – Contact Devices for Diagnostic Aid

4.1 – Shells for Radiological Location of Orbital and Intraocular Foreign Bodies

Chevallereau (1911)

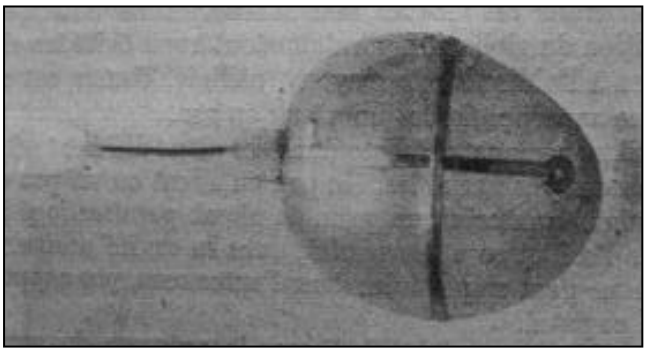


Figure 19-6
X-Ray Marker Shell presented in 1911 by Chevallereau.
The celluloid shell has two platinum wires embedded in it in the form of a cross. The shell is extended with a small sleeve allowing its precise centering on the eyeball.
(Bulletin de la Société d'Ophtalmologie de Paris, 1911, p. 300)

The radiological location of metallic foreign bodies in the eye and orbit was made from the beginning of the 20th Century using metallic fixed markers, either on the cornea or on the eyelids. In 1911, *Chevallereau* read a communication from *Godechou* and *Perduto* before the Paris Ophthalmological Society with the title,*"**Localisation des corps étrangers metalliques de l'oeil et de l'orbite"** (Localization of metallic foreign bodies of the eye and orbit)"* and described a more accurate procedure. The authors used a celluloid contact shell in which they embedded two platinum threads:

"Our apparatus consists of a small celluloid shell having more or less exactly the shape of an artificial eye. In the center of this shell and embedded in its substance there is a small cross of platinum wire of which the vertical portion extends practically the whole length, whilst the horizontal branch has only two little arms of 12 mm, each ending with a distinctive sign: a small circle and a small cross. That can be useful for differentiating the two horizontal branches. The device terminates with a small tail, more precisely with a little sleeve soldered at that level corresponding with the external commissure." (40)

Wessely (1916)

In 1916, *Wessely* (Würzburg) reported that he had *Müller Brothers* of Wiesbaden put together a set of blown-glass shells that included lead markers in the corneal or limbal zones. The "*thin glass prostheses in the form of shells*"(41) of *Wessely* were distributed on a large scale for the localization of metallic foreign bodies that were particularly frequent in the course of World War I. A frontal and lateral X-Ray with the prostheses sufficed to indicate if the foreign body was situated in the globe of the eye or behind it. A localization more exact than that was, nevertheless, difficult.

Engelbrecht (1918)

In 1918, *Engelbrecht* described a "crossed metal wire prosthesis" (Drahtkreutzprothese) for the stereoscopic localization of foreign bodies by metal wires embedded within celluloid shells. Interpretation of the results was not easy and had to be done by comparison with a model acting as a "eyeball skeleton" (Skelettbulbus) of celluloid.

4.2 – Shells for the Examination of Ocular Media

The microscopic examination of intraocular structures at the slit-lamp remained for a

long time limited to areas directly reachable in the luminous beam and could be seen without the interposition of devices. This was of particular importance for the examination of the chamber angle and the structures of the fundus. (42)

Salzmann (1914 – 1915)

The examination of the chamber angle at the slit-lamp was only occasionally possible for a long time, e.g. in the presence of a very protuberant cornea, particularly in high myopes and buphthalmos or by depression (*Trantas*). In order to reproduce the situation where the cornea possesses a high curvature, *Salzmann* had *Zeiss* construct for him a contact shell modeled on that of *Fick's*, but with a more convex anterior surface. In order to evacuate the air bubbles from this curved shell, he designed an instrument for pouring, the nozzle of which is slipped under the shell in order to top up the liquid film with physiological saline. With this instrument, *Salzmann* claimed to have always been able to examine the irido-corneal angle. (43)

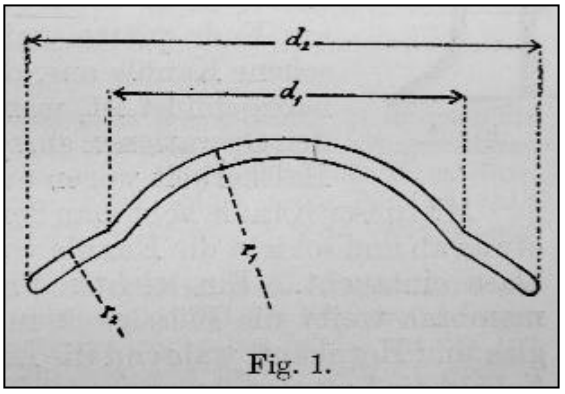


Fig. 1.

Figure 19-7
Salzmann's Shell for Gonioscopy
The Salzmann shell took its inspiration from Fick's shell. The parameters indicated by Salzmann are the following: front optic zone radius: 7.00 mm, optic zone diameter: 11.50 mm, scleral zone radius: 13.00, total diameter: 17.00 mm, thickness of the lens in the center of the optic zone: 0.60 mm.
(Salzmann Maximilian, "Die Ophthalmoskopie der Kammerbucht", Zeitschrift für Augenheilkund,e 34, 1915, fig. 1, p. 27)

Koeppe (1919-1920)

In 1918, *Koeppe* presented the results of his experiments with contact-shells specially designed for gonioscopy and for the examination of the ocular fundus. (44) In his opinion, the *Salzmann* contact shell that took its inspiration from *Fick*'s shell was insufficient and made examinations under high power particularly frustrating by reason of the reflections from the anterior surface of the lens. He therefore designed two contact devices, a "wet-chamber" (Vorschaltekammer), and an "overlay-glass" (Auflageglas) which was very popular and widely distributed.

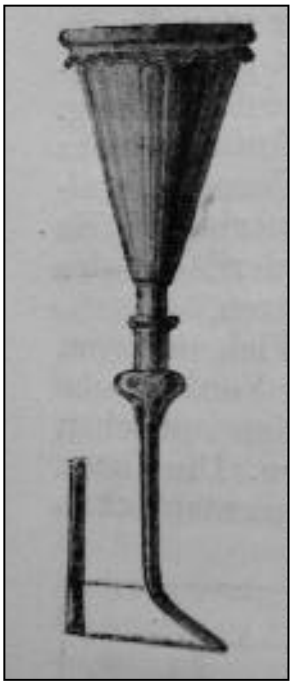


Figure 19-8
Salzmann device for evacuating air bubbles and filling the space with a film of liquid
The space produced by the difference of the radii of curvature between the anterior surface of the cornea and the posterior surface of the contact-shell is filled spontaneously by air. In order to fill this space with physiological saline solution, Salzmann had them construct a metal instrument in the form of a funnel filled with water and shut in its superior part by a rubber membrane, A flat cannula, introduced under the shell, is attached to its inferior part. Applications of pressure on the rubber membrane allow aspiration of air and the injection of liquid.
Salzmann Maximilian, "Die Ophthalmoskopie der Kammerbucht", Zeitschrift für Augenheilkunde 34, 1915, fig. 2, p. 27)

The "wet chamber" consisted of a hollow sphere made of glass with an external radius of curvature of 15.00 mm, provided by a current of physiological serum introduced into its upper part and evacuated from below. The hydrodiascope-like device is enclosed in a metallic carrying zone that is water-tight thanks to a rubber girdle that adheres to it as opposed to the fluids of the orbit. The dimensions of the device are 22.00 mm vertical and 33.00 mm horizontal. The most anterior part is positioned 13.50 mm in front of the center of the cornea. A head bandage holds the whole contrivance against the orbit.

The “overlay-glass” (Auflageglas) is to be used for gonioscopy and fundus microscopy. It has an optical zone 8.00 mm wide and a front optic zone radius of 10.00 mm. The optic zone is surrounded by a carrying zone that gives the shell a total diameter of 22.00 mm. The posterior surface possesses a corneal zone of 8.00 mm back optic radius on a 12.00 mm optic zone. The transition between the optical and peripheral parts is gradual (i.e. progressive transition).

In 1925, *Troncoso* perfected the examination procedures, specifically by inventing a “gonioscope” and he became an ardent proponent of the “*Koeppe* contact glass”.

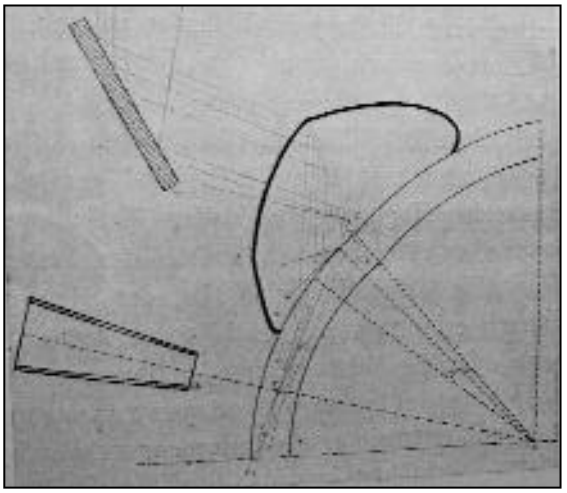


Figure 19-9
Schematic representation by Koeppe of the first contact shell model for gonopscopy and fundus examination.
The Koeppe contact-shell eliminates corneal reflections and focuses the microscope on the chamber angle or the ocular fundus. It is used with a special mirror for focusing incident light.
(Koeppe L., "Die Untersuchung des Auges im polarisierten Lichte der Gullstranschen
Nernstspaltlampe", Bericht der Deutschen ophthalmologischen Gesellschaft, 41, 1918, p.277, fig.1)

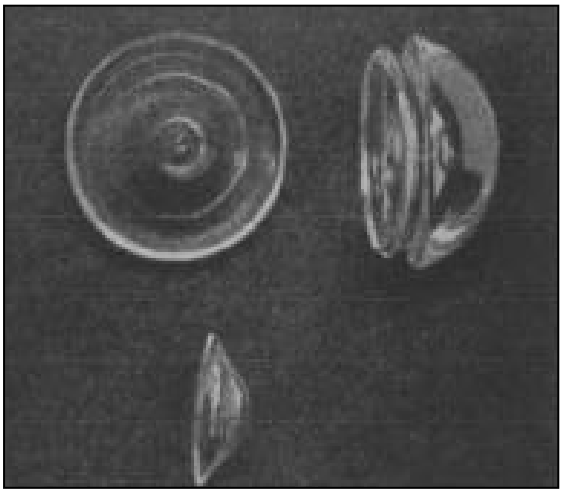


Figure 19-10
Koeppe's and Salzmann's contact glasses.
In 1925, Manuel Uribe Troncoso became an ardent propagator of gonioscopy. He clearly summarizes the complex presentations of Salzmann and Koeppe in his publications. This illustration carries the legend: "Above: front and side view of Koeppe's contact-glass. Below: side view of Salzmann contact-glass."
(Troncoso M. U. "Gonioscopy and its clinical applications", American Journal of Ophthalmology, 8, 1925, p. 433)

Notes

1 A detailed assessment of the phenomenon of "the eye-following illusion" of the statue of the "Scribe accroupi" (the squatting scribe) in the Louvre was recently published (*Enoch et al*. 2001, & 2002).
2 Lauscha is today still a center for the manufacturing glass eyes and the seat of several manufacturing companies for glass decorative objects, including Christmas tree decorations.
3 The communication of *Guiseppe Albini* was presented to the *Academy of the Sciences in Naples* on November 5, 1870. It was published under the title of *"Gli Opistoblefari"* in *Rendiconti dell' Accademia delle scienze fisiche e matematiche, Società reale di Napoli 1870, 9, 193-196* and in the *Annali di Ottalmologica* 1871, 1, 101-102. (1871/a). A summary of the communication appeared under the title "*Opistoblefari"* in *Annales d'oculistique,* 1871, 65, 188-189 (1871/b), the text of which is translated partially in the item "*Conical cornea, Shells for* - " in the *American Encyclopedia of Ophthalmology*, 1914, 9, 2995. Another summary, in German, is found in the *Jahresbericht über die Leistungen und Fortschritte im Gebiete der Ophthalmologie – Bericht für das Jahr 1870,* by *Albrecht Nagel*, Tübingen 1872, 241.
4 *Albini* 1870, p. 193-194, see Appendix 19-1.
5 *Albini* 1870, p. 195, see Appendix 19-1.
6 *Albini*, 1870, p. 196, see Appendix 19-1.
7 The effect of an anesthetizing solution of cocaine was not described until 14 years later (*Koller,* 1884*).*
8 *"Im Jahre 1887 sandte uns Geh. Rat Sämisch einen Patienten dessen rechtes Auge nach unten völlig frei lag, weil das untere Lid durch Karzinom völlig zerstört und bis auf den Orbitalrand geschwunden war. Am oberen Lid fehlte der temporale Teil, während der Rest knotig verdickt war mit Einwärtswendung der Wimpern. Es sollte durch Vorlegung einer durchsichtigen Kapsel der Augapfel gegen die Luft geschützt und weiter Austrocknung der Kornea, deren Epithel bereits in nekrotischem Zerfall begriffen was, vorgebeugt werden [...]. So entschlossen wir uns, eine Schale mit durchsichtiger Kornea herzustellen, welche nach Art einer dünnen Prothese den Augapfel bekleidete. [...] Wir bildeten also demgemäss die Schale. Der Patient trug sie fortan ununterbrochen Tag und Nacht". (Friedrich A. & Albert C. Müller,* 1910, p. 69).
9 The preparation of a "protective shell" (Schutzschale) for *Fränkel's* female patient was not mentioned by *Friedrich A. & Albert C. Müller* (*Das künstliche Auge*, 1910). According to *Friedrich E. Müller* (1920), it was in 1892, at the time of the manufacture of this shell for *Fränkel,* (i.e. 3 to 4 years after the publications of *Fick, Kalt* et *August Müller*), that the ocularists *Müller Brothers* indicated that they had noticed the refractive effect of glass shells, but declared that they had not immediately drawn any conclusions with a view to possibly providing an optical correction. The *Müller Brothers'* priority rights with respect to contact shells are described in chapter XV : *Early Blown Contact Lenses.*
10 *"1892 erhielt eine Patientin des Herrn Dr. Fränkel in Chemnitz eine Kontaktschale zum Schutz ihres rechten Auges vor Schädigung durch unheilbares Entropium und Trichiasis ; auch sie vertrug die Schale dauernd, ohne Beschwerden."* (*Müller, Friedrich E.,* 1920, p. 11).
11 *Bartisch* tranlated into English by *D.E. Blanchard,* 1996, p. 187. Original text: *"Als denn nim ein Bley / das noch nie genützt ist / schlag es dünne / und lege es zwischen die zwei Liede auff das Auge. Desselben Bleyes teil oder seite / so auff das Auge kömbt / sol mit Rosen öl bestrichen werden."* (*Bartisch* 1583, symblepharon at p.185 & ankyloblepharon at p.187)
12 *"Interposition d'un des corps étrangers énumérés plus haut, celle d'un œil artificiel par exemple"*
13 *"L'interposition de corps étrangers entre la paupière et la globe, comme les lames de plomb (Partisch), un morceau de vessie (Callisen), ou de parchemin (Solingen), une coque de cire (Rosas), un oeuil artificial trempé dans l'huile d'amandes douces (Demours), une coque d'ivoire préalablement ramollie dans l'acide hydrochlorique (Carron du Villards)."* French translation of the fourth edition of *Mackenzie's* Treatise (1854) completed and annotated by *E. Warlomont* and *A. Testelin* (1856-1857).
14 *Duke-Elder* 1970, p. 773.
15 Session of March 20, 1888. - See also chapter XI : *Eugène Kalt's "Optical Treatment" of Keratoconus.*
16 *"Ce que je revendique comme pouvant être utilisé, […] pour la greffe conjonctivale dans le symblépharon, etc., c'est l'interposition entre les paupières de coques en verre, ainsi que nous nous en servons depuis longtemps à notre clinique." (de Wecker* 1889, p. 101)
17 *"Hanke-Wien legt bei aussergewöhnlichen Verwachsungen zwischen Bindehaut und Lidern nach Ausschälung und Entfernung der Narben durchsichtige Schalen ein, die mit einem Röhrchen verbunden sind, das nach aussen führt. Das hat den Vorteil, dass man die Wunde leicht spülen kann und da die Schalen durchsichtig sind, auch die Wunde gut beobachten kann."* (*Hanke*, 1916, p. 101, presented at the annual meeting of the Deutsche Ophthalmologische Gesellschaft).
18 *"Wessely (Würzburg) empfiehlt sein Verfahren der Einlegung dünner, schalenförmiger Glasprothesen in den Bindesack" – "Salzer (München): Die Wesselysche Prothese ist auf der Augenstation in München vielfach verwendet worden"* (*Wessely* 1916, p. 196. Meeting of the Hungarian Ophthalmological Society, held June 11-12, 1916 in Budapest).
19 *"Bei Schrumpfung, resp. Vollständiger Verwachsung der Augenhöhlen [...] zwängt er in das breit ausgehöhlte Kavum eine sterilisierte d.h. frisch ausgekochte Augenprothese hinein." (Majewski* 1916, p. 202. - Meeting of the *Hungarian Ophthalmological Society,* held June 11-12, 1916 in Budapest).
20 *"Wir ließen zu diesem Zwecke durch die Firma F. Ad. Müller Söhne in Wiesbaden Glasschalen*

herstellen, die zwischen den Augenlidern und dem Augapfel getragen, die Bildung von Verwachsungen zwischen Lid und Augapfel hinanhalten sollten. Die Glasschalen sind kalottenförmig, ihr Krümmungsradius entspricht etwa dem Krümmungsradius des Augapfels ; in ihrer Mitte ist ein Loch, dessen Durchmesser wenig größer als jener der Hornhaut ist. Seitlich von diesem Hornhautloch können weitere kleine Löchelchen angebracht werden." (*Illig,* 1917/a, p. 94).

21 *"Mit den Resultaten bin ich im ganzen recht zufrieden; allerdings [...] war ein tägliches herausnehmen der Prothese wegen der ziemlich erheblichen Sekretion aus der Konjunktivalhöhle notwendig."* (*Carsten* 1917, p. 198).

22 Cited by *Much*, 1932, p. 389.

23 *Panas*, 1885.

24 *"La cornée très amincie, se moule exactement dans leur concavité et se trouve, par le fait, redressée. Si la courbure du verre est bien choisie, on peut réaliser un état voisin de l'emmétropie, et, fait important, la vision se trouve améliorée dans toute l'étendue du champ visuel." (Panas*, 1888/a). Presentation to the *French Academy of Medicine*, session of March 20, 1888. - See also chapter XI: *Eugène Kalt's "Optical Treatment" of Keratoconus.*

25 *"Je choisis parmi mes coques en verre très minces et transparentes, une qui s'adaptait parfaitement au globe oculaire droit du jeune malade, sans permettre l'insinuation de bulles d'air. […] j'appliquai la coque en verre qui s'ajustait merveilleusement, en tenant exactement la greffe en place." (De Wecker* 1889, p. 100).

26 It is *Louis Auguste Demarres* (1810-1882).

27 *"je tiens à vous faire observer que je n'ai pas le moins du monde eu l'intention de réclamer pour moi la priorité de l'usage des coques en verre mince et transparent, dont l'emploi remonte probablement même au delà du temps de Desmarres père. Ce que je revendique comme pouvant être utilisé pour la greffe cornéenne […], c'est l'interposition entre les paupières de pareilles coques en verre, ainsi que nous nous en servons depuis longtemps à notre clinique."* (*De Wecker* 1889, p. 100-101).

28 *"Grâce aux rondelles gélatineuses Houdé, on peut sans se ruiner, malgré le prix élevé de la cocaïne, faire bénéficier tous les malades de la découverte nouvelle, puisque une rondelle, suffisante en général pour cocaïniser un sujet, ne coûte qu'un sous! La rondelle se dissout dans l'œil clos et rien ne s'en perd ; toute la surface conjonctivale est ainsi baignée d'une solution lacrymale, à laquelle aucun de ses recoins n'échappe."* Cited by *Warlomont* 1885, p. 176.

29 *"M. le docteur Galezowski lit une note à l'appui de la présentation de rondelles de gélatine dont il se sert pour pratiquer l'occlusion immédiate de la plaie cornéenne après l'extraction de la cataracte." (Galezowski* 1885/a, p. 1357). See also *Heitz,* 1987/b.

30 *Galezowski* 1885/b. (*Galezowski* was a member of the editorial committee of the *Receuil d'Ophtalmologie*). A publication in German was published under the title, *"Von der Schliessung der Hornhautwunden mit Gelatinstreifen nach der Extraction des grauen Staares"* (On the closure of corneal incisions by means of gelatine strips after cataract surgery) in the *Centralblatt für praktische Augenheilkunde* (*Galezowski* 1885/c). That publication included numerous translation errors, causing certain passages to be incomprehensible. The editor of the revue, *Julius Hirschberg*, had not bothered to correct these errors, notwithstanding the fact that he spoke many different languages as well as being an outstanding linguist and a real connoisseur of the French language.

31 *"Aujourd'hui, l'expérience est faite sur un très grand nombre de malades, je l'ai appliquée dans plus de 160 cas d'extractions de la cataracte, […], dans un grand nombre d'ulcères rongeants de la cornée, soit après l'opération, soit sans opération, et je puis déclarer en toute franchise que je n'ai jamais vu le moindre accident qui puisse être attribué à la présence de la gélatine dans la cavité intra-palpébrale."* (*Galezowski* 1886/a, p. 225).

32 *"Relativement au pansement des yeux opérés de la cataracte, je tiens à confirmer les déclarations que j'ai faites devant le Congrès l'année dernière: c'est que l'application des plaques de gélatine antiseptique directement sur la plaie cornéenne prévient plus que tout autre moyen les accidents inflammatoires et favorise la cicatrisation."* (*Galezowski* 1887, p. 112).

33 Introduced into France by *Eugène Kalt* in 1894.

34 *Mules* 1894, p. 62. (Presentation to the First Session of the *Eight International Ophthalmological Congress,* Edinburgh).

35 *Mules* 1894, p. 62 note 1.

36 *Albini* 1870, p. 195, see Appendix 19-1.

37 *Albini* 1870, p. 194, see Appendix 19-1.

38 See the details of these studies in chapter X: *Adolf Eugen Fick's "Contactbrille"*.

39 *"Das dritte Kunstauge entsprach schon wesentlich besser, indem der Kranke mit demselben 6/12 sah. […]. Die Blendung war wesentlich verringert und trat nur noch beim gehen auf grell besonnter Strasse auf.* (*Pichler* 1919, p. 74). – See also description of *Pichler's* experiments in chapter XVII: *Three years of Monopoly for Müller's Contact Shells.*

40 *"Notre appareil consiste en une petite coque de celluloïd ayant à peu près exactement la forme d'un œil artificiel. Au centre de cette coque et incrustée dans la matière se trouve une petite croix en fil de platine dont la branche horizontale règne sur presque toute la hauteur, tandis que la branche verticale ne présente que deux petits bras de 12 millimètres terminés chacun par un signe distinctif: un petit cercle et une petite croix. Il peut être utile de différencier les deux branches horizontales. L'appareil se termine par*

une petite queue, plus exactement un petit manche soudé au niveau qui doit correspondre à la commissure externe." (*Chevallereau* 1911, p. 299-300) – Lecture to the *Société d'Ophtalmologie de Paris* (Paris Society of Ophthalmology), Session of December 5, 1911, from a text drafted by "*Messrs. R. Godéchoux et E. Perdu* (Amiens)".

41 *"Einlegung dünner, schalenförmiger Glasprothesen in den Bindehautsack"*. Presentation before the meeting of the *Hungarian Society of Ophthalmology*, held on June 11 and 12, 1916, in Budapest. (*Wessely* 1916 p. 196).

42 After 1901, *Trantas* carried out experiments for the ophthalmoscopic examination of the chamber angle and ora serrata using digital depression of the eyeball. (*Trantas*, 1907).

43 The term "Gonioscopy" suggested by *Troncoso* in 1921, has been adopted by *Salzmann* in 1924.

44 Presentation to the Association of Halle Physicians (*Verein der Ärzte zu Halle)*, followed by presentations to the *German Ophthalmological Society* and by numerous publications in *Graefe's Archiv für Augenheilkunde* between 1918 and 1920.

Appendix 19-1

Transcription of

Gli Opistoblefari; Nota del Socio Ordinario **Guiseppe Albini**
(Adunanza del di 5 novembre 1870)

<Società Reale di Napoli Rendiconto dell'Accademia delle Scienze Fisiche e Matematiche
Anno IX - Fasc. °1° - p. 193-196 - Gennajo 1870 - Napoli Stamperia del Fibreno 1870>

L'idea da me concepita di applicare nei casi di cecità per leucoma totale della cornea, delle cannule simili a quelle adoperate per la fistola gastrica, era basata sulla convinzione acquistata per lunga esperienza, che i metalli nobili, come tutti I corpi stranieri, levigati, di forme convenienti e di sostanze non alterabili dai liquidi organici, e percio senza azuine chimica sui tessuti e sugli umori, possono esser facilmente tollerati in cavità o canali naturali od anomali del corpo, si che l'individuo vi si abitua, nè ha ragione di ricordare la loro presenza se non quando vi dirige l'attenzione, come appunto non pensa mai ai propri organi finchè dessi sono in condizioni fisiologiche. Ne fanno prova le cannule nelle fistole gastriche, i pessarî, i denti e gli occhi artificiali, ecc. ecc.
Le stesse consideazioni e convinzioni m'indussero a far costruire delle piastrine metalliche sullo stampo della parte anteriore visibile del globo oculare, per introdurle di dietro od al disotto delle palpebre, e cosi esercitare, mediante una semplicissima fasciatura applicata al davanti delle palpebre chiuse, une pressione uniforme sul globo oculare, allo scopo di restituirlo alle forme fisiologiche nei casi frequenti in cui queste sono alterate, come p. es. nelle diverse forme di stafilomi, nelle ectasie della cornea ecc.

Opistoblefaro per l'occhio destro veduto di prospetto in A e di profilo in B

Gli effetti veramente sorprendenti, da me ottenuti in brevissimo tempo, mediante queste piastrine, in un'inferma persentatasi all'ambulanza con stafiloma recemoso assai prominente, per cui era impossibilitata a chiudere le palpebre, m'incoraggiarono a proseguire ed estendere l'utile applicazione di questo piccolo istrumento.
E innanzi tutto mi corse al pensiere di praticare nel centro della piastrina un foro un poco più piccolo della pupilla, per farla servire in luogo dei cosi detti occhiali stenopei, proposti dal fisiologo ed oculista olandese Carlo Donders.
Questi occhiali sono utilissimi per la visione distinta di oggetti piccoli, p. es. stampa o manoscritti, nei casi in cui la cornea ha conservato in un piccolo punto la sua trasparenza normale. Naturalmente in questi individui la molta luce diffusa che penetra nell'occhio attraverso alla parte offuscata della cornea, elide e confonde i pochi raggi che attraversano la limitatissima porzione trasparente della stessa, et cosi l'individuo vede confusamente o non vede affatto gli oggetti esterni, per l'istessa ragione per la quale noi di giorno non vediamo le stelle. Ma come gli astri diventano visibili in pien meriggio quando si elimina la luce diffusa, cosi, anche gli infelici affeti da offuscamenti quasi generali della cornea, mediante un poco di esercizio e studio, possono arrivare a leggere e scrivere armando l'occio cogli occhiali di Donders; i quali nella loro forma primativa, erano rappresentati da un mezzo guscio di noce, da applicare davanti all'occhio per togliere ogni luce diffusa e per guardare a traverso al forellino praticato nel guscio in corrispondenza ed in direzione del punto trasparente della cornea. Per quanto la forma primitiva abbia subito delle modifiche che l'ingentilirono, cio non toglie che l'occhiale stenopeo sia sempre incomodo, pel suo peso e pel calore che procura all'occhio. Gli stessi effeti, anzi più pronti, si possono ottenere mediante le mie piastrine pertugiate, dappoichè queste si adattano all'occhio e toccano direttamente la cornea, e per cio l'individuo non ha d'uopo di muovere il globo dell'occhio per portare il punto trasperente della cornea nella direzione del forellino dell'occiale, ma il forellino si trova già bello e fatto al punto opportuno.
Innanzi di passar oltre ad accennare le utili applicazioni pratiche di queste piastrine, debbo dichiarare che

la scelta del materiale di costruzione mi creo non lievi imbarazzi, e cio, sia per il costo quanto per le qualità fisiche dello stesso materiale destinato a stare tra il bulbo e le palpebre, senza impedirne i movimenti e senza alterarne i tessuti.

I metalli nobili, l'oro ed il platino, dovevano essere esclusi pel loro prezzo. Altri inconvenienti di questi metalli, non che dell'argento, erano il peso e la durezza.

Il peso specifico faceva pure escludere il piombo; il ferro, il rame, le leghe, non si prestavano perchè più o meno alterabili dagli umori organici. Non rimaneva altro che l'alluminio, il quale per la sua leggerezza, mallealilità e grado di duressa non puo essere, a mio avviso, sostituito da altra sostanza.

Infatti si lascia facilmente modellare, tagliare, perforare, limare e levigare, di modo chè, l'oculista stesso puo dargli, seduta stante, le forme necessarie. L'unico difetto che ho trovato fin ora in questo metallo, per l'usa in parola, si è che non puo subire elevata temperatura senza fondersi, e per tanto non si presta allo smalto onde ridurlo allo stato di occhio artificiale coi colori della sclerotica, della cornea, dell'iride, ecc. ecc. Credo per altro d'aver quasi trovato il messo per ottenere l'istesso scopo senza lo smalto a fuoco. Cio naturalmente riguarda soltanto la parte estetica delle piastrine, alle quali, docendo dare un nome che esprima la loro applicazione, proporrei quello di Opistoblefari, cioè retropalpebre.

Altre utili applicazioni degli Opistoblefari sarebbero le seguenti:

1°, di difendere la conguintiva bulbare dall' azione caustica di sostanze applicate sulla congiuntiva palpebrale a scopi terapeutici, per distruggere granulazioni, tracomi ecc. in quasti casi poi gioverebbero esercitanto una contropressione sulla congiuntiva palpebrale;

2°, nè meno utili saranno gli Opistoblefari per proteggere la cornea ulcerata e favorirne la cicatrizzazione. Gli oculisti di tutti in tempi ebbro a deplorare la lentezza veramente straordinaria del processo riparatore in alcune ulceri della cornea; ne è raro il caso di vederle resistere a qualunque cura per settimane e mesi. Non v'ha dubbio che le cause principali, per cui tali ulceri non cicatrizzano, sono, il contatto coll'aria atmosferica e l'attrito o soffregamento delle palpebre; perchè l'individuo ben difficilmente giunge colla forza volontà a tener costantemente chiuse le palpebre, o si addata a portare una fasciatura, la quale poi è spesso controindicata tanto per la pressione che esercita quanto per il riscaldamento inevitabile dell'organo;

3°, gli Opisoblefari potrebbero servire da un lato come occhio artificiali da applicarsi senza alcuna operazione, purchè il bulbo dell'occhio non sia atrofizzato, non che potrebbero adoperarsi come occhiali applicandovi nel foro delle lentine di quarzo di diversi gradi di convessità o concavità;

4°, infine non vuol'essere trascurata la proprietà che hanno come metalli di essere cioè eccellenti conduttori dell'elettricità e del calorico, e cio sia per deviare come per portare all'occhio correnti elettriche o termiche.

Termino questa mia breve comunicazione col rendre le debite lodi al signor Giovanni Bandiera, macchinista della notre Università, per la premura ed intelligenza mostrata nell'esecuzione e perfezionamento delle descritte piastrine.