

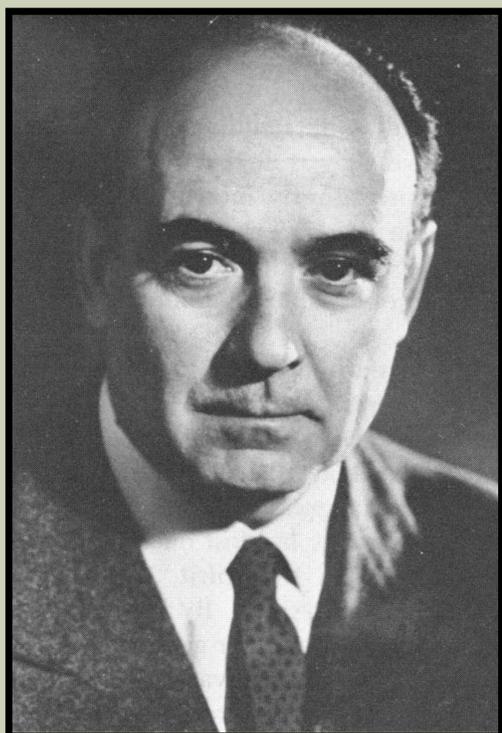
Castroviejo's Double-Bladed Knife

RANZCO Museum

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Introduction

Up until recently, corneal opacities posed a significant management problem for ophthalmologists with various keratoplasty techniques which had poor and uncertain outcomes.



Ramón Castroviejo

Born in 1904 in Logroño, Spain, Ramón Castroviejo was to become a pioneer in keratoplasty. In 1920, he studied medicine at Madrid's Central University, and in 1929, he accepted a fellowship to assist Dr Fisher at the Ear, Nose, and Throat Hospital and College of Chicago in the United States of America. After passing his American Board Examination in 1930, he returned to Europe to study the various techniques being developed for keratoplasty in Prague and surrounding countries.

Principles

In the early 1930's after returning to the United States, Ramon Castroviejo critically reviewed the literature of corneal transplantation and summarised the key principles:

1. Donor material must be from the same patient or from the same species
2. Donor material must be taken from live patients or soon after death
3. The sooner the transplantation occurs after the graft has been dissected, the less degeneration of the finer structures
4. Total keratoplasty invariably resulted in opaque corneas
5. Lamellar keratoplasty is only applicable to very superficial lesions due to scarring
6. Penetrating keratoplasty produced the best result
7. Scissors, forceps and sutures traumatize and opacify the implant
8. The donor transplant must correspond exactly with the host defect
9. The transplant must be held in position with sutures

The Double-Bladed Knife

In 1932, Castroviejo applied the principles of previous corneal methods and developed the square keratoplasty technique.

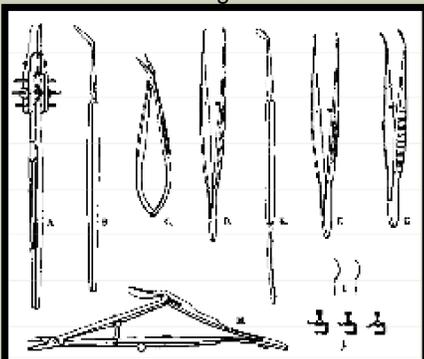


Castroviejo's Double-Bladed Knife

The Castroviejo Double-Bladed Knife was a key component in the square keratoplasty technique, employing the use of two parallel razor blades. The distance between the blades was variable which allowed grafts to be cut in different sizes reproducibly.

Later models were fitted with thumb screws, scale and a rack-and-pinion allowing greater ease of use.

The double-bladed knife was used to outline the square grafts by cutting 2/3 deep into the cornea. The incision was then completed with a special keratome and straight scissors.



Instruments necessary for Castroviejo's partial penetrating square keratoplasty technique.

Experiments / Results

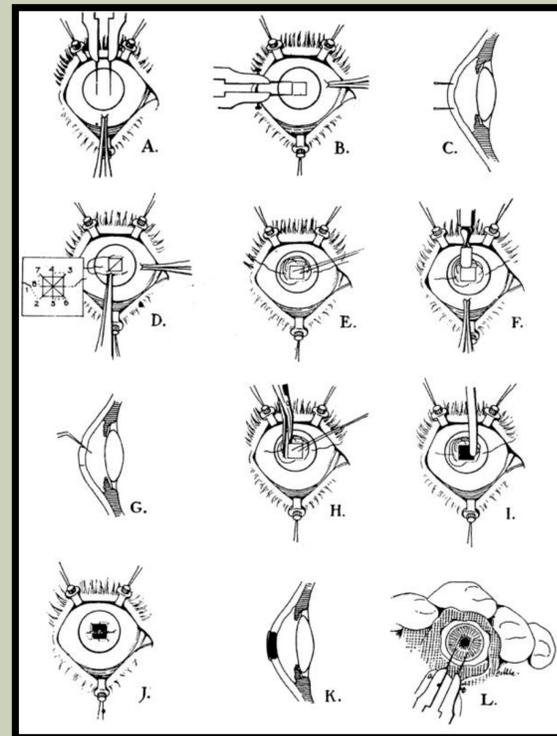
In 1932, Castroviejo reported his first experimental square corneal transplants on 40 rabbits with normal corneas. 35% maintained long-term clear transplants. He later experimented on 30 rabbits with leucomatous corneas and progressed to seven unselected human subjects, three of which remained clear.

In 1941, he reported on 200 human square corneal transplants with 90% obtaining long term success.

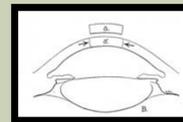


Rabbit with clear square corneal graft

Technique

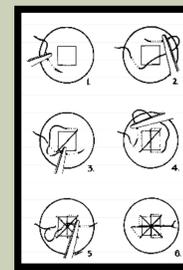


Castroviejo's technique of square partial penetrating keratoplasty. A-H: removing the host defect. I-K: securing the donor transplant. L: obtaining the transplant from a cadaver using the same method.



Partial bevelling

The inner 1/3 of the incision of the host cornea was bevelled at 20° to prevent the graft from falling into the anterior chamber.



Continuous corneal suture

The suture applied even pressure to the corners and the middle of the graft. Importantly, it avoided piercing the graft, which invariably, led to opacification. The suture was removed on the 6th postoperative day.

Outcome



Clear square corneal graft

In the 1950's, square corneal grafts lost its popularity as circular trephines advanced and patients demanded the more aesthetically pleasing circular grafts. Castroviejo, as well as others, contributed to the advancement of circular grafts.

On January 1, 1987, aged 82, Castroviejo died from laryngeal cancer in Madrid as one of the 10 most influential ophthalmologists of the 20th Century.