

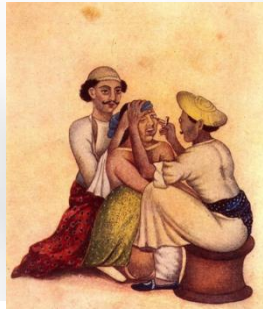
VON GRAEFE KNIFE

Taking the eyes out of the clouds

In Young Chung, David Kaufman

RANZCO  MUSEUM

Cataract surgery throughout the history



Surgeons in ancient India practiced couching

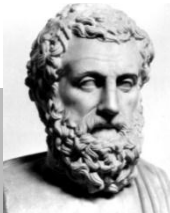
The Code of Hammurabi contained section regulating couching



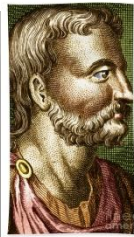
Sharp successfully performed intracapsular cataract extraction



Aristotle thought the lens are a postmortem artifact of phlegm accumulation



Celsus described the lens consisting of a 'humour' or liquid



Daviel published the first account of cataract extraction

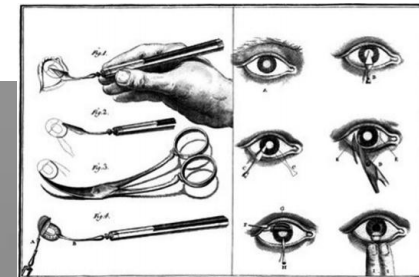


Fig. 8 Daviel's cataract extraction technique using the instruments he designed. Taken from: Albert DM, Edwards DD, eds. History of Ophthalmology. Cambridge, Mass.: Blackwell Science, 1996.

‘Cataract Wars’

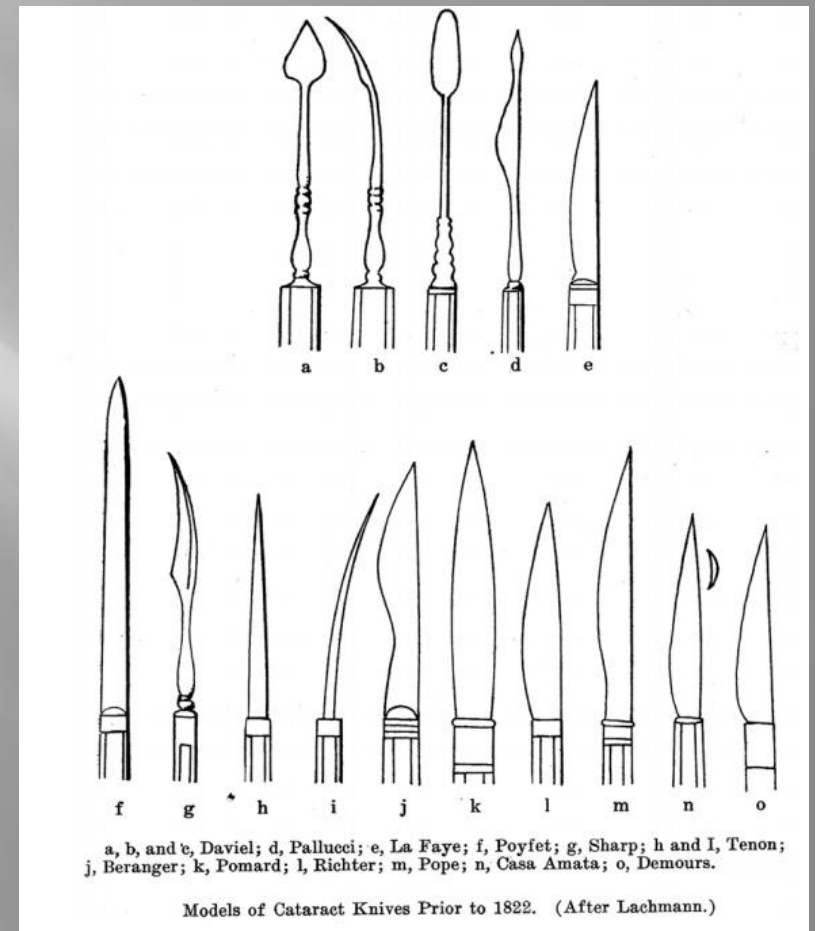
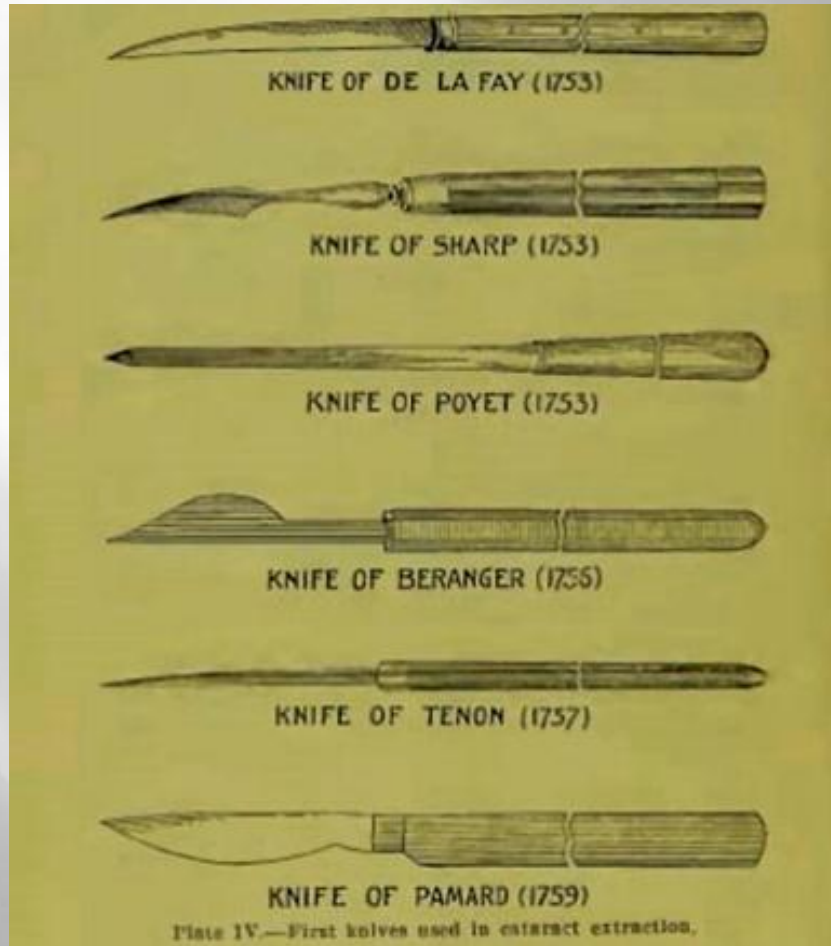


Figure 2 and 3: Daviel's cataract knives and its rivals prior to 1822.¹

Who is Albrecht von Graefe?

- ▣ German ophthalmologist who is often referred to as “the founder of scientific ophthalmology”.
- ▣ One of the most important figures in 19th-century ophthalmology.
- ▣ His contributions:
 - ❖ Introduced iridectomy for glaucoma
 - ❖ Identified regression of the eyelid in Basedow’s disease
 - ❖ Described the combination of retinitis pigmentosa and perceptive deafness in Usher’s syndrome
 - ❖ Provided early descriptions of optic neuritis, chronic progressive external ophthalmoplegia, and papilloedema
 - ❖ Designed of a specialised knife, the “von Graefe knife” for cataract surgery
- ▣ Graefe died in Berlin from pulmonary tuberculosis at the age of 42.

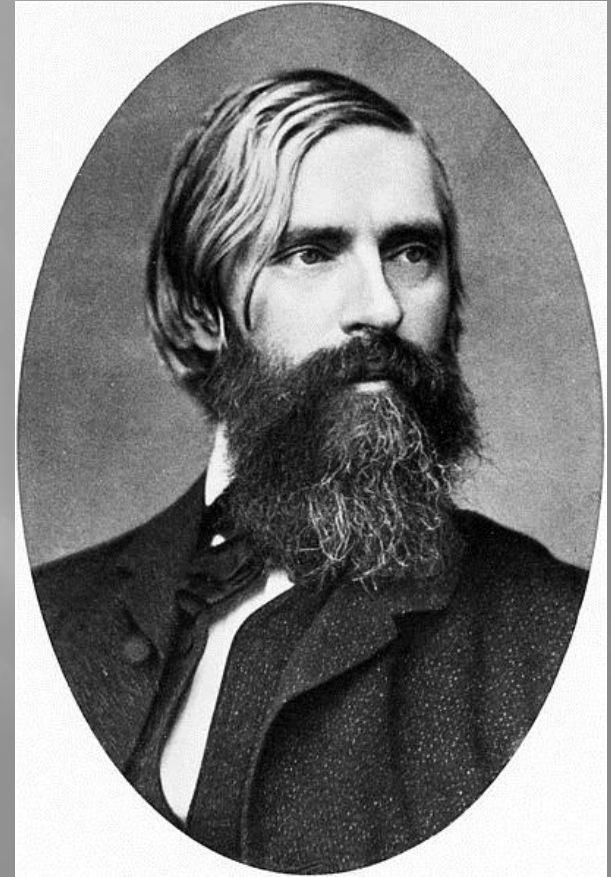


Figure 4: Albrecht von Graefe
(22 May 1828 – 20 July 1870)

von Graefe knife (instrument)

- ▣ von Graefe knife has the narrow tapered blade designed to keep the anterior chamber from collapsing as a double puncture was pre-formed.
- ▣ von Graefe improved Daviel's extracapsular cataract extraction technique using a superior corneal incision.
- ▣ von Graefe knife was utilised for more than 100 years.

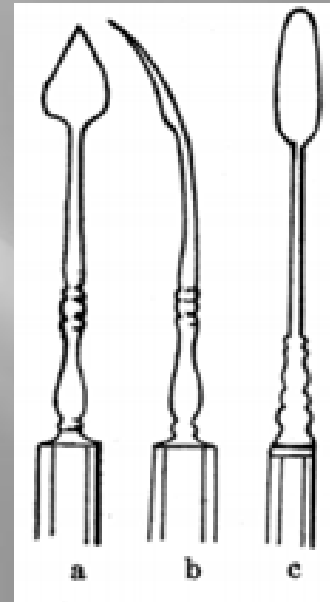


Figure 5: (Left) Daviel's knives.¹

Figure 6: (Right) von Graefe knife.²

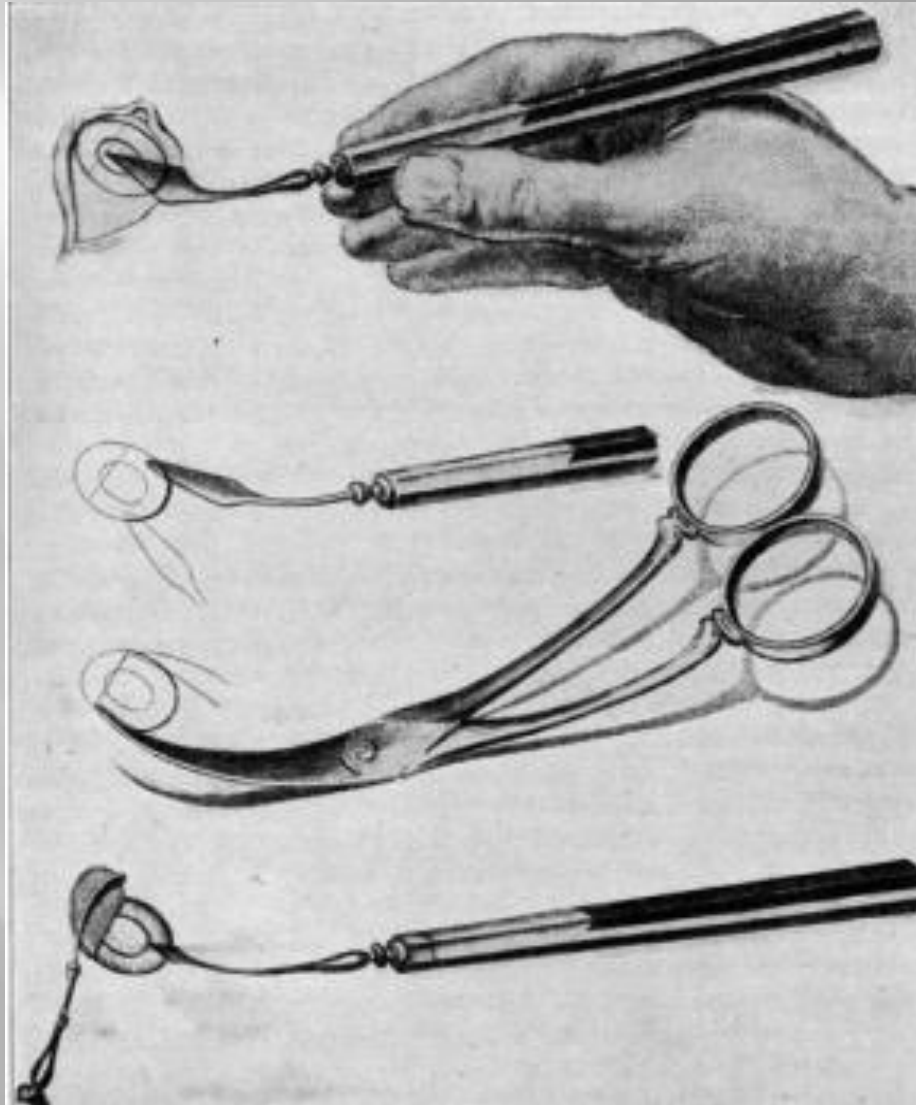


Figure 7: Daviel's cataract extraction method.³

von Graefe knife method

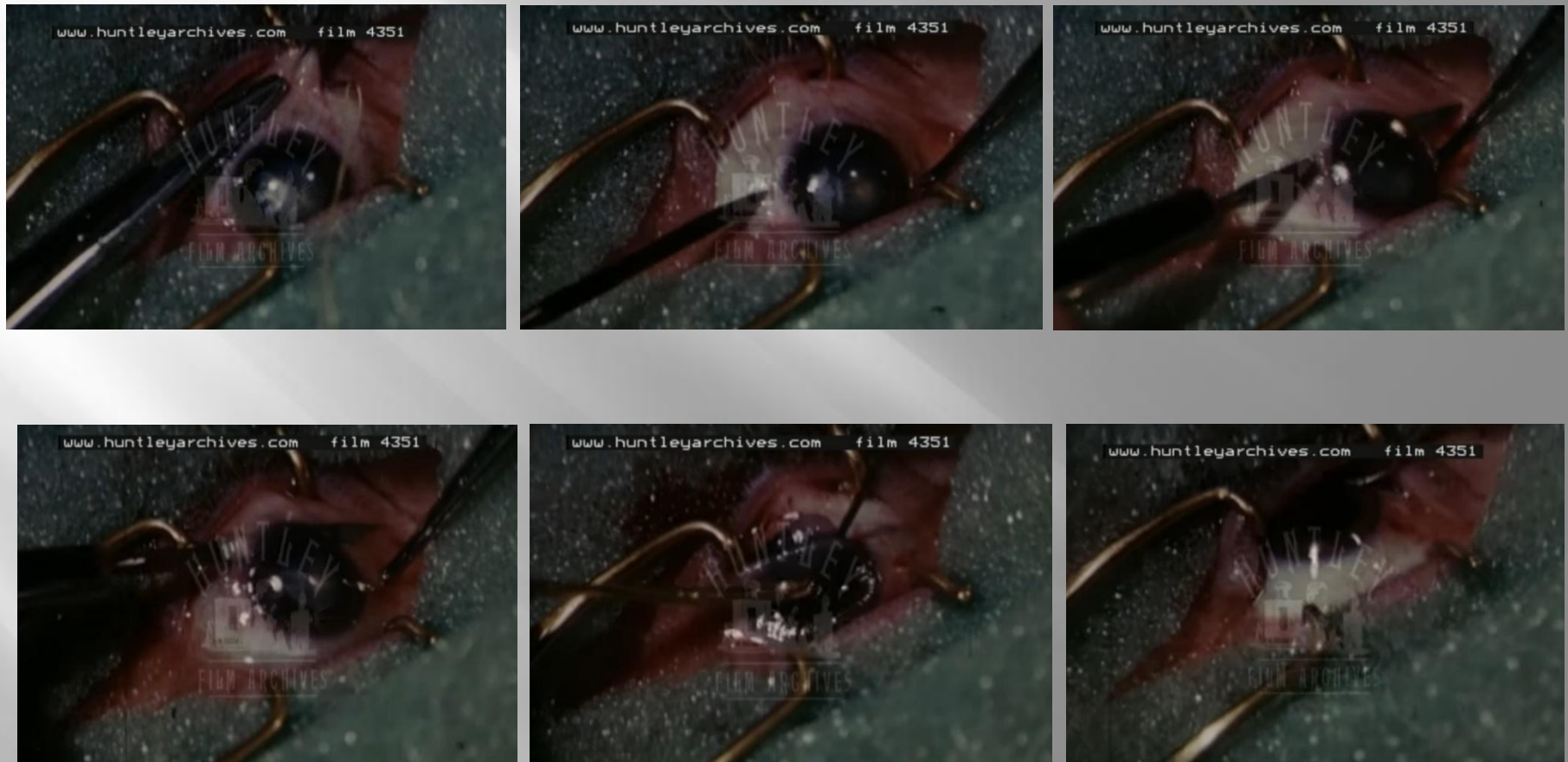


Figure 8: von Graefe's cataract extraction.⁴

Advantages

- ▣ Graefe's surgical procedures, as reported by a number of his colleagues, resulted in a reduction in suppurative events following cataract surgery.
- J. Jacobson of Konisberg (1884) completed a retrospective survey of his 30 years in practice and found von Graefe's technique (3-5% failure rate) vs. The old classical semicircular corneal incision technique (10% failure rate); in the years 1883 and 1884, he had not a single case of endophthalmitis among 137 extractions.⁵
- ▣ Shortening of the operative time
- ▣ A well-performed von Graefe knife maneuver produced a corneal or limbal incision with well-opposed edges that resulted in rapid healing and a scar that was almost invisible to the naked eye.⁶
- ▣ Performable without an operating microscope

von Graefe knife through history

- ▣ von Graefe knife method was adopted by surgeons around the world in the mid-1800s.
- ▣ An essential part of cataract surgery was mastery of the von Graefe knife until the acceptability of the keratome-and-scissors method after the early 1940.⁶
- ▣ von Graefe knife was to continue in use for almost 100 years following his death and was integrated in various modified operations such as Smith-Indian operation from the end of the 19th and beginning of the 20th century.⁷

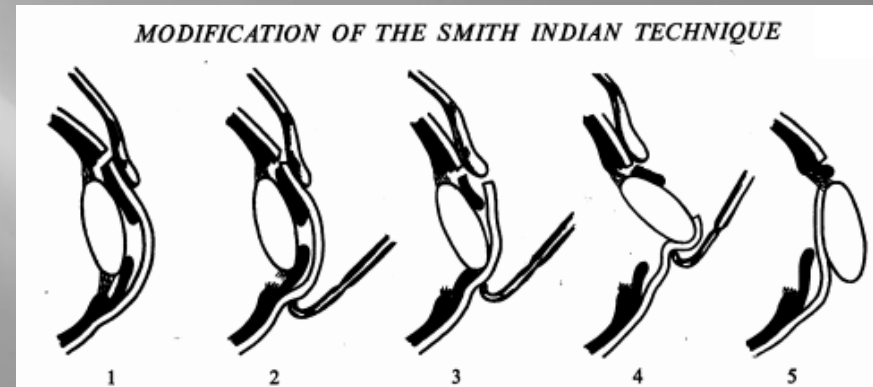


Figure 9: The modified Smith Indian Technique.⁷

The Issues

- ▣ If the surgeon was not ambidextrous, the use of the von Graefe knife might be difficult with the non-dominant hand.
- ▣ The lens is removed whole and the patient is left aphakic, causing the patient to be reliant on thick glasses with distortion of peripheral vision.⁶
- ▣ A poorly made von Graefe knife incision could lead to horrendous disasters.⁶

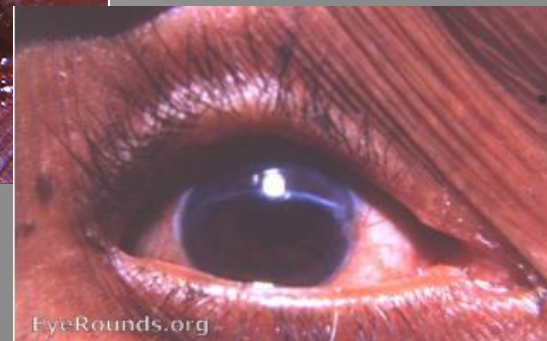
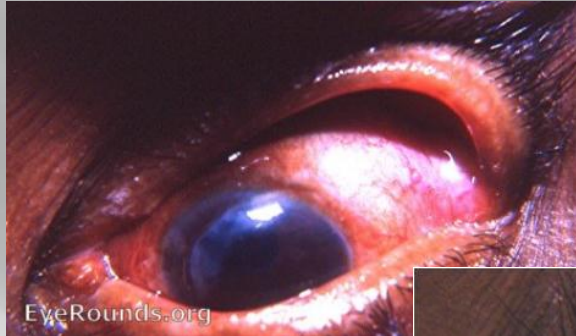
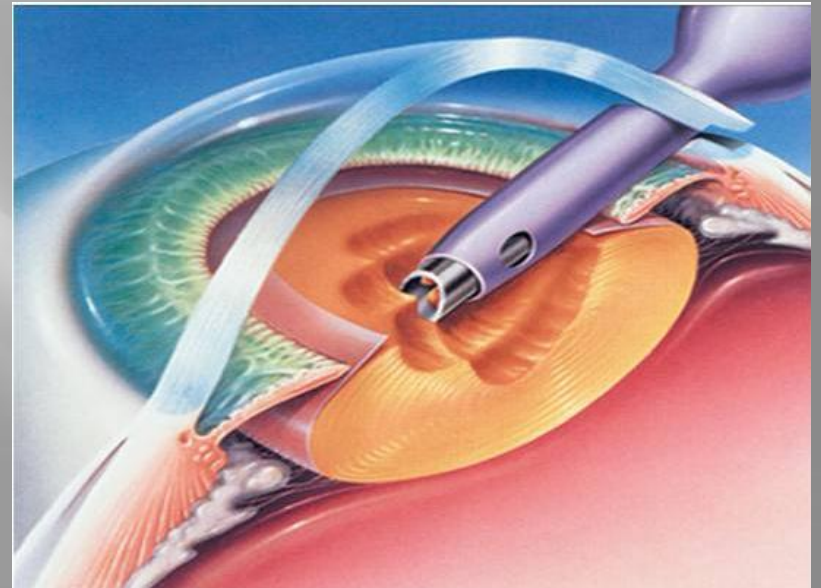


Figure 7: Complications of the poorly operated von Graefe incision.⁷

Current Day Practice

- ❑ In the 1980s, the large incision surgery technique combined with intracapsular cataract extraction (ICCE), such as von Graefe technique, became obsolete due to the rising popularity of the Kelman phacoemulsification technique.
- ❑ However, the use of the von Graefe knife still continued in India well-beyond that in the West.
- ❑ The high-volume of routine cataract surgery in India led to Indian eye surgeons being among the most experienced and adroit in the world, resulting in the outstanding rural Indian cataract camps. Formally trained Indian ophthalmologists were and are among the deftest in the use of the von Graefe knife.⁷
- ❑ Douglas Koch MD at the ASCRS Ophthalmology Hall of fame:
"It is hard to imagine one whose techniques were adopted by more surgeons and utilized over a broader period of time".⁹



Acknowledgement

- ▣ Dr David Kaufman
- ▣ Dr Kristen Wells

References

1. Albert DM. Jacques Daviel: The Invention of Modern Cataract Surgery. In: Marmor M, Albert D, editors. Foundations of Ophthalmology. Cham:Springer; 2017. p.11-22.
2. Newman SA. Albrecht von Graefe: The Beginnings of Scientific Ophthalmology and Education. In: Marmor M, Albert D, editors. Foundations of ophthalmology : Great insights that established the discipline. Cham: Springer; 2017. p.95-116.
3. Wood CA. The American Encyclopedia and Dictionary of Ophthalmology. 8th edition. Forgotten books. 2018. p. 1638
4. HuntleyFilmArchives. Ophthalmic Techniques, 1960s – Film 4351. [Video on internet]. 2016 [updated 2016 Feb 3; cited 2019 Aug 20]. Available from: <https://www.youtube.com/watch?v=yclpASNTGtU&t=115s>
5. Hirschberg J. The History of Ophthalmology Vol 11 1-b: the Reformation of Ophthalmology Wavenboreh: Kugler publications; 1922. p. 51.
6. Caccamis W. The von Graefe incision in cataract surgery: an historical note. [Image on internet]. 2011 [updated 2008; cited 2019 Aug 15]. Available from: <https://webeye.ophth.uiowa.edu/eyeforum/atlas/pages/The-von-Graefe-incision-cataract-surgery-historical-note.html>
7. NIRANKARI MS, MAUDGAL MC. A modification of the Smith Indian technique of intracapsular cataract operation. BJO. 1957 Aug; 41(8): 487-491.
8. Ravin J G. An Indian Adventure: Derrick Vail's Shikarpur Fragments. Arch Ophthalmol. 2003;121(5):720-724.
9. Kohnen T. The ASCRS honoring of Albrecht von Graefe. Graefes Arch Clin Exp Ophthalmol. 2000;238:807.