



Ocular and Eyelid Surgical Anatomy in Georg Bartisch's "Ophthalmodouleia"

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Abstract

Georg Bartisch, a 16th century barber surgeon, published in 1583 his treatise entitled "Ophthalmodouleia" (Greek term meaning eye service), a work in German to promote ophthalmology for his countrymen barber surgeons. He did not have an academic education nor knew classical languages, he had used a triplet in terminology by using German, Hellenic and Latin nomination in his anatomical descriptions. Various accurate illustrations and a peculiar system of presentation with flap to liken an in-depth presentation were demonstrated to add prestige in his work. This raises concerns for another medical surgeon to have helped for this publication. Bartisch innovative approaches introduced various surgical tools. Cataract surgery was the epitome of his work. Anatomy of both the eye and the eyelids was there for only to serve the operation. Religion, magic and Galenic views presented barriers for Bartisch's scientific development. However, he is considered as the patron of German School of Ophthalmology.

Key words: Galen; Cataract; Eyelid cutters; Dissected plates; German ophthalmology.

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Introduction

Georg Bartisch (1535-1607) is projected as the founder of Ophthalmology in Germany (Figure 1a). Although he had not received an academic medical education and belonged to the circle of the barber surgeons his accomplishments in ocular surgery secured him a place in history. He had begun his apprenticeship since the age of 13 gradually developing amazing skills in ophthalmology, being considered as a pioneer in this field. In 1588, he became the official oculist of Duke Augustus I of Saxony (1526-1586).¹ During his medical career Bartisch wrote two important treatises. The first, published in 1575 about lithotomies under the title "Art book in it is the whole thoroughly right definite report and proof

and instruction about hard painful tearing pain embarrassing bladder stones" (Original German title: *Kunstbuch derinnen ist der gantze gründlich vollkommene rechte gewisse bericht und erweisung unnd Lehr des Hartenn Reissenden Schmerz hafftigen Peinlichen Blasenn Steines*) had not received a great acceptance by the medical cast.² The second one though, a book about eye diseases and ocular surgery gained inordinate fame. Titled "Ophthalmodouleia, this is eye-service: newer and successive report of causes and findings of all afflictions and defects of eyes and face" (Original German title: *ΟΦΘΑΛΜΟΔΟΥΛΕΙΑ, das ist Augendienst: newer und wolgegründter Bericht von ursachen vnd Erkenntnis aller Gebrechen Schäden*

und Mängel der Augen und des Gesichtes), published in 1583, it became the first ophthalmology book written in German (Figure 1b).³



Figure 1: The Barber Surgeon Georg Bartisch (1a) and his treatise *OΦΘΑΛΜΟΔΟΥΛΕΙΑ* (*Ophthalmodouleia*), Stöckel, Dreßden, 1583 (1b)

This historical vignette aimed through documentary research to review and present the majestic figure in ophthalmology Georg Bartisch, recording simultaneously his opinions in ocular and eyelid surgical anatomy.

Georg Bartisch's ocular and eyelid anatomy

In his fundamental work in ocular surgery the third chapter of the first part was devoted to the anatomy of the eye as a human organ. Both eyes were considered as extensions of the brain, being parts of the central nervous system. This explains an inner towards the outer parts of the eye anatomic description. He believed that the most important part of the eye was the ocular nerve. He had suggested that the optical nerve was being developed through the first inner ocular tunic named retina. He had proposed a horizontal almost oval nerve shape being extended beyond the centre of the organ anteriorly. He had supported the idea of various humours being included in the eye. Thus, retina was filled by *vitreous humour*, while crystal lens was filled by crystalloid. The small size of the *crystalloid humour* covered by the arachnoid tunic combined with its eccentric place was forming the concave shape of the anterior border of the retina. Outer

of the retina and distantly reaching the uvea the exists the choroid tunic. It seems that the later included the above-mentioned anatomical structures, while the rest of the space remained was filled with the *aqueous humour*. Bartisch gave vivid descriptions of the pupil, cornea, sclera and conjunctiva. Cornea covered uvea, outer was sclera which was considered as an extension of the *dura mater* and conjunctiva was the outer tunic of the eye which extended at the limits of the ocular muscles. Regarding the ocular muscles, he had described six oculomotor muscles, up, down, right and left of the bulbar, two others rising from the inner and the outer canthus (noted by Bartisch as big and small canthus) and finally the *musculus retractorius bulbi* which encircled the ocular nerve.³

Bartisch considered the eyelids as the entity which fortify the eyes. Each eyelid was attached to the nose through the large canthus and through the small one to the cheekbone. The movement of the upper eyelids (only those were considered as movable parts) was mentioned as a wonderful property of the human body. Thus, the upper eyelids were structures being moved by muscles which arose locally, reaching the tarsus of the eyelids, at points just below their skin fold. Their innervation was recorded as being shared with that of the temporalis muscles and that of the occipital and forehead regions. Tarsus was mentioned and the ligament-cartilage under the skin part which gave shape to the eye.³

The first thing which is worthwhile to note that although Bartisch's book was written in German, he used the Latin names for every anatomical part of the eye, while sometimes he had also added the Hellenic terms. He had recorded the following terms, *nervus opticus*, retina or *retiformis* or *ἀμφιβληστροειδής* (Greek), *humour vitreous* or *vitriiformis* or *glacialis* or *ύαλοειδής* (Greek), *humour crystallinus*, *humour albugineus* or *aqueous* or *ύδατοειδής* (Greek), *arana* or *ciliaris* or *ἀραχνοειδής* (Greek), *pia mater* or *tenuis membranea* or *secundina* or *χοροειδής* (Greek), *uvea* or *acinosa* or *corona* or *στεφάνη* (Greek) or *ύρις* (Greek) or *πανοειδής* (Greek), *cornea* or *κερατοειδής* (Greek), *dura mater* or *dura* or *crassa membrana* or *sclerotica* or *σκληρός* (Greek), *conjunctiva* or *adhata* or *έπιπεφυκότας* (Greek), *musculus* (for ocular muscles).³

The second to note is that Bartisch drawn his own-coloured anatomical sketches using flaps,

as successive sheets one above the other in order for the reader to acquire an in-depth perception. By lifting the upper flap to see the subjacent anatomical parts, reaching inner layers, tunics and humours of the eye would have been depicted in a profile mode. Although he had drawn some of the ocular veins, he did not thoroughly describe them in his ocular anatomy. The same happened for the arteries too, which had been almost neglected.³

Discussion on surgical anatomy and era's achievements

Bartisch lack of higher medical education was replaced by superstition and the divine combined with knowledge of the past. Both parents of the oculist surgeon should have been God-fearing, the surgeon himself should have been ambidextrous so that he could easier operate and prayers should have been used to attract God's help and remove magic. Magic was among the causes of various diseases and surgeon should have been married to dispel it. Bartisch worshiped God and Galen. The Galenic views on anatomy dominated his thought. Nevertheless, he had suggested that the optical nerve was the epicentre of this sense organ, being a projection of the brain. *Ophthalmodouleia* was the first ophthalmology textbook written for the common German people, with the purpose to educate barber surgeon of the time.⁴

Bartisch considered eyelids as the structures which protect the eye, which in its turn originates from the central nervous system. This is why he had also described the anatomy of the brain in an ocular manuscript to emphasise upon their tissue connection. To testify his opinions, he had added various anatomical sketches depicting from the top of the head an open cranium to demonstrate the brain as seen from above going deeper until the area of the optic nerves. The optic chiasm was an already known anatomy fact since the antiquity,⁵ recorded by Rufus of Ephesus (1st c AD)⁶ and Galen (2nd c AD),⁷ (Arrington and Mart-Ibanez, 1959) while Leonardo di ser Piero da Vinci (1452-1519)⁸ and Andreas Vesalius (1514-1564)⁹ had already illustrated it in their anatomical drawings. Nevertheless, Bartisch failed to depict it and the optical nerves were simply represented

as thin straw lines which almost form an oblique angle when they reach the inner parts of the brain.³

Bartisch had unambiguously stated that he did not received an academic medical education. Therefore, his anatomy knowledge especially for the eye was probably derived from his practical experience. As it was almost impossible to have dissected an eye, he had most probably performed dissections in animal eyes. Being a practical physician he was not interested in a detailed and accurate description of anatomy. However, his work contained excellent anatomical figures, presented in a peculiar way. The plates depicting the dissected eye, were presented as “dissected plates” as they were named. Layers of flaps demonstrated topographical anatomy giving the impression and an imaginable human body (Figure 2).¹⁰

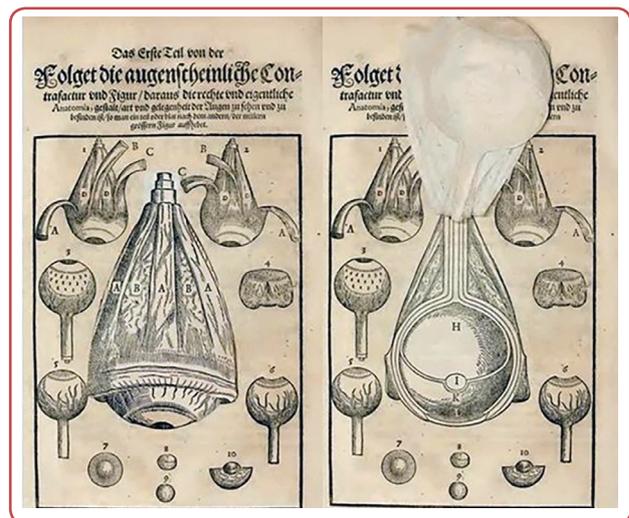


Figure 2: Bartisch's anatomical sketches of the eye using the flap-dissected plates system of presentation, figures derive from his book *Ophthalmodouleia*

Ocular anatomy by Bartisch¹¹ was influenced by Andreas Vesalius' anatomy book¹² published a few years earlier, filtered by Galen's relevant anatomical theories, even though the contradiction that Vesalius fought Galenic views.¹³ The similarities between Vesalius and Bartisch such as the oculomotor muscles, *musculus retractorius bulbi* and the descriptions of ocular tunics and humours were obvious, but an exact copy can't be supported. Bartisch failed to describe the seventh muscle enveloping the optical nerve, but he had surprisingly displayed excellent drawings of the six muscles, which were better than those included in Vesalius work.¹⁴ His volition to use Latin and Greek terms for

the anatomical parts and the use of flaps was probably an attempt to give a more sophisticated approach for his treatise. Bartisch himself was ignorant of the classical languages; the Greek and Latin phrases with which his book is larded were probably contributed by some itinerant scholar or perhaps an educated surgeon to allow him to produce an appreciable self-published treatise.¹⁵

Apart from surveying the descriptive anatomy of the eye, it is of importance to examine the surgical anatomy of the eye in Bartisch's work, so that to confirm the minor role that anatomy had played in his daily practice. One third of his treatise was devoted to the surgical treatment of various ocular diseases, while many drawings depicted patients and the practice of ocular operations upon them. Meanwhile various surgical tools and apparatuses were also demonstrated.³ Thus, surgical operations, as those of cataract and tumour excisions attracted attention. Regarding cataract surgery which was the commonest in the era¹⁶ (Heinrich, 1916), he had been performing it by using the couching method. Although Antyllos (1st half of 2nd c AD)¹⁷ and Abu'l-Qûsim Ammar ibn Ali al-Mawsili (9th - 10th c AD)¹⁸ had introduced the suction method, Bartisch was among the pioneers who followed the couching method. He was capable to introduce a fine needle temporally from cornea to conjunctiva, then by turning it forward, he could reach the crystal lens, pushing it downwards. He had underlined how dangerous this operation was, by mentioning a cluster of symptoms like massive haemorrhage, severe pain, oedema, tearing and photophobia.³ It appears that anatomy was only respected for operation to be as successful as it could be and had not been taken into account its complexity. Anatomy existed in such an extent to only help ocular surgeon to reach crystal lens. As expected, Bartisch's daily experience allowed him to perform the operation by pushing crystal lens or humour crystallinus anteriorly, deeper than those who previously attempted it. The cataract operation was the main applied in eyeball and orbit, while the removal of foreign bodies from the white substance was also performed. Another type of surgical intervention concerned pterygium, trichiasis, eyelid tumours and ptosis,

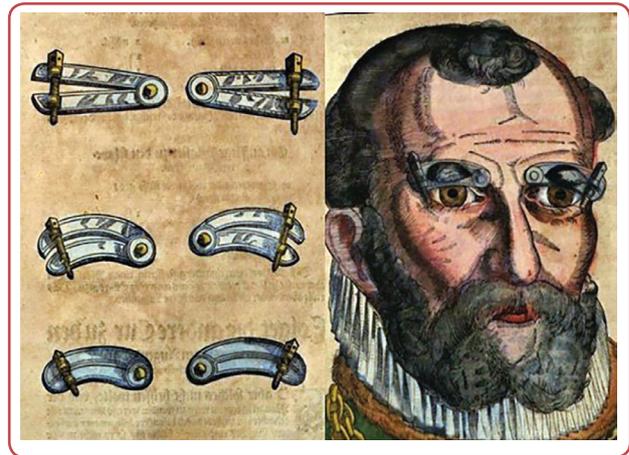


Figure 3: Eyelid cutters (left) and its application for the excision of tumorous formations of the eyelids (right) from inside Bartisch's book *Ophthalmodouleia*

all treated with excision of an eyelid fold. The technique was simple, cut and remove, scalpel, cutters and innovative tools, almost as if he did not care about patient's pain or aesthetic results (Figure 3). *Lagophthalmos* was not mentioned.³ The brutality of Bartisch surgical methods may be found in almost all of his approaches. From the enucleation of eyeball and exenteration of the anatomical parts of the orbit, all exhibited rough manipulations.¹⁹ Bulbar and orbital cancer or severe injuries in those anatomical areas or acute inflammation misinterpreted as cancer, were performed by cutting the inflicted area, considered as malignancies. A series of novel surgical instruments in different sizes according to the dimensions of the patient's eyes, clumsy in appearance had been introduced due to his innovative imagination. During the enucleation, the surgeon could pass a suture vertically through the eyeball and then pull it out by lifting the upper eyelid and pushing a special spoon-like scalpel towards the bone and sclera. For his exenteration operation he used all his "violent" tools like chisels, scrapers and knives in order just to remove all tissue parts until the exposure of the optical nerve.³ Muscles and bone structures were not to be saved and had been sporadically injured. Therefore, these techniques were later improved by majestic figures in ocular surgery, like Wilhelm Fabricius von Hilden (1560-1634)²⁰ and Carl Ferdinand Ritter von Arlt (1812-1887).²¹

Conclusion

Georg Bartisch was an ophthalmologist who in 1583 published a monumental inclusive text in German devoted exclusively to the eye. The grandiose language, including Greek and Latin create suspicion that Bartisch employed a scribe to edit and embellish the book for him. Galenic limitations and absence of medical knowledge restricted somehow surgical methods described in *Ophthalmodouleia*. This treatise offered nothing in the study of descriptive ocular anatomy as it followed previous knowledge. Empirical barber surgeon, manufacturer of peculiar tools, good writer, Bartisch became famous for his cataract surgical method. Meanwhile, his beautiful illustration and presentation techniques still remain somehow in vogue; a fact which alone testifies a scientific magnitude. Unexpectedly, Georg Bartisch has a place among the most significant figures in ophthalmology, coined to be the founder of the German school.

Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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Ethics

Our institution does not require ethics approval for articles reporting the history of medicine.

Author contributions

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Conflicts of interest

The authors declare that there is no conflict of interest.

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