• Biography •

Dr. Father Wacław Szuniewicz, a forgotten pioneer in refractive surgery and his work in China

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Abstract

• Father Wacław Szuniewicz (1891-1963) was a skilled ophthalmic surgeon, missionary, and teacher. For several years he worked in China, afterwards in the United States and in Brazil. The aim of the paper is to present the unanalyzed issues of Szuniewicz's research regarding corneal refractive surgery. Szuniewicz performed experiments on changing the corneal curvature with anterior, posterior and full-thickness incisions. The results of modifying the anterior and posterior corneal curvature were satisfactory, however, diminished significantly within months after surgery. Corneal band resections were superior in terms of efficacy, however, such an intervention commonly led to complications in animal studies. Szuniewicz's work was not published during his life. Nevertheless, as a result of strong impact of his personality and ideas, he is frequently considered as a pioneer of corneal refractive surgery.

• **KEYWORDS:** corneal band resections; corneal incisions; missionary; refractive surgery
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INTRODUCTION

Father Wacław Szuniewicz (1891-1963) is considered as one of the pioneers of contemporary refractive surgery. Although Szuniewicz's biography has already been published[1], his contributions to corneal refractive surgery have not been scrupulously analyzed. The New Haven ophthalmologist, Dr. Rocko M. Fasanella believed that Szuniewicz's findings are an important achievement in refractive surgery, and presented them posthumously in two articles[2-3]. For this analysis, we have searched the Rocko Fasanella collection of documents of the Yale Library, and the letters sent by Szuniewicz to Poland collected at the Mission Museum of the Polish Province of the Congretation in Kraków, Poland, which were not published previously.

Biography Wacław Szuniewicz (Figure 1) was born in Głębokie (at that time Polish lands occupied by Russia), presently in the Vitebsk region of Belarus, on December 26th, 1891. He graduated from medical studies in Moscow in 1916[4]. Shortly after receiving his diploma he was recruited into the Russian Army and served on the Minsk Front. After the war he worked in the Smoleńsk Hospital, then was evacuated to Woroneż, and in 1922 moved to Vilnius[1]. He settled there for several years and worked at the Department of Pediatrics and at the Department of Ophthalmology at the Stefan Batory University. In 1927 he started his missionary studies at the Theological Seminary of the Vincent a Paulo Missionary Order in Cracow. In 1930 he became a Catholic priest. Szuniewicz believed that missionaries should not only provide spiritual care, but support healthcare in remote communities[5]. In order to provide such support, he decided to leave Poland and move to China.

Szuniewicz arrived in Tianjin (Tientcin), China on January 9th, 1931[1]. After moving to Shuntehfu (Shundefu, current name Xingtai), Hebei Province, China, he began a 19-bed missionary hospital. In his letters, Szuniewicz mentioned that at that time, eye diseases (and particularly trachoma) were a plague in China. He presumed that this could be associated with the specific terrain conditions with high amounts of dust, as well as low availability of freshwater. Another problem that he has encountered was the wide-spread presence of quackery; Szuniewicz noted these practitioners commonly visited fairs, and were performing surgery promptly, with a neglect of the basic rules of antisepsis. As a consequence, the development of iatrogenic infections was not uncommon. Moreover, the local community showed prejudice to a Western medicine. In the letters to his colleagues and family, Szuniewicz commonly expressed gratitude for every single surgical tool that was donated for the mission from Poland[6].

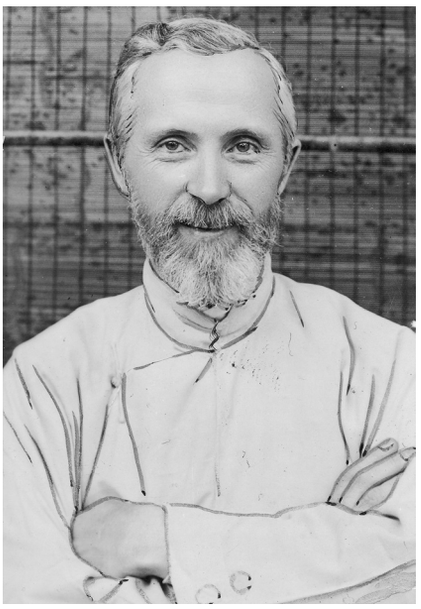

Figure 1 Father Wacław Szuniewicz (1891-1963) during his service in China in the 1930's.

In the following years, Szuniewicz put an enormous effort into missionary work. Out-patient consultations were conducted without any charge to the patient. Within a few years a small hospital evolved into a large 100-bed clinic with several outpatient departments located outside the city[7]. Interestingly, Szuniewicz drove between these infirmaries on a bicycle. Szuniewicz personally was able to examine about 145 000 patients and conduct up to 800 cataract extractions per year. He also performed surgeries for entropion, chalazion, pterygium, glaucoma trepanation, iridencleisis, eye muscle surgery, and scleral shortening for retinal detachment. In total, he was able to carry out more than 5000 surgical procedures annually. This was not possible without the help of several Chinese ophthalmologists that he trained, nuns and volunteers (Figure 2). Due to political changes, the mission was closed by local authorities in 1946, however, it is considered as the foundation for the hospital which subsequently was created.

Currently, the hospital is one of the largest ophthalmic hospital in northern China with 800 in-patient beds. The team of Hebei Eye Hospital continues the surgical and diagnostic traditions started by its first director Dr. Wacław Szuniewicz. There are a lot of memory sites in the hospital dedicated to the founder. A bas-relief monument of Szuniewicz is situated in front of the entrance (Figure 3), while in the museum of the hospital's history, a board depicting the history of the hospital from the first director to the present (Figure 4) can be found. Annually, 600 000 out-patients are treated in the clinic, 20 000 hospitalizations are admitted to the hospital and 30 000 operations are performed, including 25 000 cataracts. The tradition of refractive surgery is cultivated—several thousands of refractive procedures are performed annually in the hospital. The entire

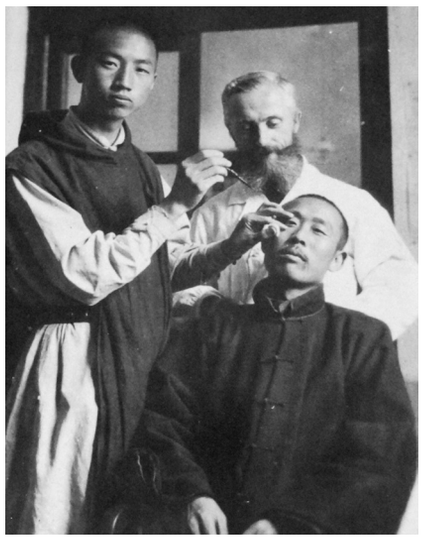

Figure 2 Father Szuniewicz with one of his scholars and a patient.

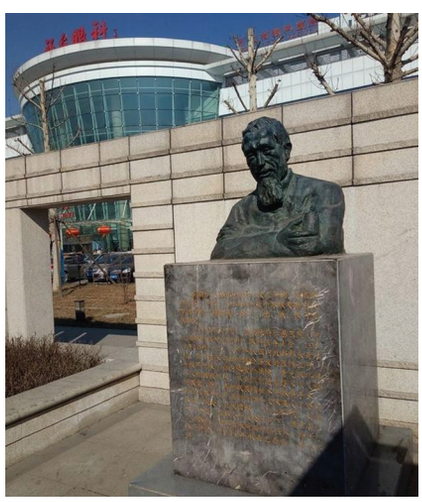

Figure 3 A bas-relief monument situated in front of Hebei Eye Hospital in Xingtai, China memorizing Szuniewicz.

Figure 4 A board depicting the history of the Hebei Eye Hospital from the first director to the present. Courtesy of Dr. Edward Wylęgała.

refractive surgery department is very well equipped with two femtosecond and excimer lasers.

In 1949 Szuniewicz moved to New Haven, United States and performed research at Yale University. Although regarded by the local academic authorities, he could never get used to the American lifestyle. He was particularly bothered by the importance of a high living standard. Therefore, Szuniewicz decided to leave towards Brazil and settled in Mafra. There he continued his pastoral and medical work in the years of 1952-1956. Afterwards, he moved to Irati in Brazil, where he worked until his death in 1963[1]. Despite his exile he remains remembered, and particularly in China, where his surname is spelled as Sunievitch.

Szuniewicz conducted research on altering the refraction by changing the shape of the cornea. This research was initiated in China, intensified at the Yale University, and continued in Brazil. His experiments were carried out on rabbits and dogs. Szuniewicz was aware of the limitations of corneal refractive surgery, and began his investigations by reviewing historical research on this topic, and particularly finding of Lans[8], O'Connor[9], Böock[10] and Sato[11]. He considered three methods for altering the shape of the cornea: anterior, posterior, and full-thickness incisions. The only medical article describing Szuniewicz's finding was published posthumously by Dr. Rocko M. Fasanella[3].

Modification of the Anterior Corneal Curvature Leendert Jan Lans (1869-1941), a Dutch ophthalmologist, had been working on keratotomy in his doctoral thesis. His findings were subsequently published in 1898[8]. He promoted the idea of corneal flattening *via* non-perforative incisions made solely to the anterior surface of the cornea. Lans believed that section of the superficial layers of the cornea could be superior to full-thickness incisions. Another approach introduced by Wray was to change the refractive properties of the peripheral cornea with cautery[12]. Radial intrastromal thermokeratoplasty led to contraction of the peripheral and paracentral stromal collagen, producing a peripheral flattening and central steepening. This treatment was used to treat keratoconus and hyperopic astigmatism. A decrease in refractive error has been achieved, although low predictability and significant regression have been observed. Interestingly, O'Connor described a case of an evident decrease in corneal astigmatism which lasted up to 9y after corneal cautery[9].

Szuniewicz employed Böck's technique applying high frequency heat for coagulation[3]. This method was used in order to increase the curvature of the cornea in a selected meridian and to treat high corneal astigmatism[10]. In the original method, a few points at the flat corneal meridian were coagulated 1 mm apart, with a 0.5 mm needle using a current of 20-30 miliampers[10]. Szuniewicz administered the current of 30-35 miliampers in 4-6 points to enhance the refractive outcome. Although this method effectively increased the curvature of the cornea in the selected meridian, the effect was limited and diminished significantly within three months[2]. Anterior corneal curvature modifications became widely-used with the advent of radial keratotomy by Soviet ophthalmologists in the 1960's[13-14].

Posterior Corneal Incisions The first to perform posterior radial half-incisions of the cornea to alter the optical properties of the cornea was the Japanese ophthalmologist Tsutomo Sato. Sato believed that procedures performed on the anterior surface of the cornea are impractical, as they induce a weak and transient refractive effect. Sato believed that the only option to effectively alter the corneal curvature is to additionally implement posterior corneal incisions. The first posterior corneal incisions were performed on patient with keratoconus in 1939, and this method was subsequently applied for treating astigmatism in the 1940's[11,15].

Szuniewicz made the use of Sato's method, although he did not possess a particular knife for such a surgery[3]. Primary the procedures were performed with a discission needle. However, it was difficult to enter the anterior chamber without injuring the iris or the lens capsule. Thus, in subsequent surgeries a Lindner's caniculotome was employed, which was sharpened at its end particularly for this purpose. This method significantly increased the corneal refractive power in a selected meridian. The refractive effect diminished over three months, however not completely, was greater than in the Böck's method. At that time it was unclear that this technique led to severe damage to the corneal endothelium and resulted in corneal decompensation in long-term. Therefore, this technique was abandoned in subsequent years.

Procedures Through All Corneal Layers In the nineteenth century the factor strongly influencing the outcome of cataract surgery was high astigmatism related to a large incision size. An idea to treat this condition was to perform a corneal full-thickness incision perpendicular to the direction of the steepest meridian of the cornea[16-18]. The first reference to a procedure for correcting astigmatism-keratotomy-was made by Hjalmar Schiotz (1850-1927) of Norway[16]. He described a case of a patient manifesting astigmatism of 19.5 diopters after cataract removal. In order to correct the patient's refractive error, Schiotz made a 3.5 mm-long penetrating incision in the steep meridian using a *von Graefe* knife. Following this treatment, the astigmatism was reduced to 7.00 D[16].

Szuniewicz's experiments aimed to change the refractive error by performing band resections of the cornea in the flat meridian. He observed changes in refraction depending on the width of the band: 1.38-2.13 D for a 4-6 mm^2 band, 3.0-3.53 D for a 7-12 mm^2 band, and 4.9-5.0 D for a 13 mm^2 and greater

band[3]. Thus, he assumed that it is possible to predict the refractive outcome of the procedure. Importantly, the effect of surgery decreased only partially, and mainly for the smallest band. Szuniewicz believed that this method was superior in terms of the refractive outcome, however, he was aware that in animal studies it commonly resulted in complications. There is no evidence that he performed experiments on humans.

Conclusion Father Waclaw Szuniewicz, MD, CM, was a skilled ophthalmic surgeon, scientist, teacher, manager, and a Catholic priest working in China, in the United States and in Brazil. It is quite amazing that he was able to work as a medical doctor on four continents.

During his stay at Yale University in the United States he performed experiments on changing the corneal curvature with anterior, posterior and full-thickness incisions, that were not published during his lifetime, and thus became largely unrecognized in this field.

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Conflicts of Interest: Kanclerz P, None; **Grzybowski A,** None.

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