Editorial

The Evolving Landscape of Glaucoma: History, Fellowship Training, and National Priorities for Pakistan

PJO – Official Journal of Ophthalmological Society of Pakistan

Doi:10.36351/pjo.v42i1.2311

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Glaucoma is a leading cause of irreversible blindness globally, hence aptly coined as the "black hole of blindness" by Parihar.[1] The origin of the word 'glaucoma' is from the Greek work 'glaukos' that signifies a greenish to grey discoloration of the pupillary area. In the Hippocratic age, 'glaukos' generally referred to a diseased eye with opacities in the media with no comprehension regarding the pathophysiological mechanisms.[2]

Then came a revolutionary change in the nineteenth century with the invention of the ophthalmoscope by Helmholtz, which made it possible to see the head of the optic nerve directly for the first time in history. This led to a distinction being made between glaucoma and other conditions such as cataract, which causes vision loss. Later, Von Graefe and Donders identified the relationship between increased pressure inside the eyeball, resulting in damage to the optic nerve, thus altering the definition of glaucoma from a condition of pressure to a chronic condition of the optic nerve.[3]

The twentieth century saw significant advancements in the diagnosis and treatment of glaucoma, such as tonometry, automated perimetry, evaluation of the optic nerve head and retinal nerve fiber layer, and development in filtration surgery. In the twenty-first century, with advancements in imaging, comprehension of pathophysiology, and development in surgical modalities, the complexities in the management of glaucoma continue to increase. The treatment guidelines in glaucoma practice now extend from simple pressure reduction to assessment of risk, structural, and functional evaluation, with overall long-term management plans.

With the advancement of the scientific and clinical knowledge in glaucoma, it has become extremely challenging to cover the subject within the rubric of ophthalmology in a way that is comprehensive enough. The treatment of complicated and secondary glaucoma, interpretation of advanced imaging, complicated surgeries such as trabeculectomy, glaucoma drainage devices, and minimally invasive glaucoma surgery (MIGS), as well as participation in research, demanded a high level of subspecialty training. This is what led to the development of fellowships and centers of excellence for the treatment of this vision-threatening disease.

In Europe and the UK, institutions such as Moorfield Eye Hospital led the way with organized fellowships in Glaucoma that also encompassed clinical, surgical, as well as research components. In a similar manner, in the United States, institutions such as the Wilmer Eye Institute of Johns Hopkins expanded on the more organized Glaucoma fellowships to prepare the ophthalmologist for Glaucoma practice. The need for Glaucoma training has been recognized by professional bodies, non-profit organizations, as well as research organizations. In this regard, bodies such as the Glaucoma Research Foundation, Glaucoma Societies of Countries, as well as Glaucoma UK, encouraged fellowships in Glaucoma as a distinct and vital specialty of Ophthalmology.

Despite such progress, however, glaucoma remains a significant public health problem worldwide. In 2020, glaucoma caused blindness in 3.6 million people (8.4% of the world's total number of blinds), while it led to moderate to severe vision impairment in more than 4.1 million people.[4] Compared with the 2010 estimates, the prevalence of glaucoma-induced blindness has significantly increased, which is consistent with the progressive but asymptomatic presentation of the disease. Glaucoma has been identified as the second leading cause of blindness worldwide, as well as the leading cause of irreversible blindness.[4] It is, however, essential to recognize that such projections tend to underestimate

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the prevalence of glaucoma, as vision loss is commonly attributed to other treatable conditions, such as cataract blindness, rather than reflecting the true prevalence of vision loss secondary to glaucoma.

This evolving but unseen need has direct implications for workforce planning in eye care. For satisfactory control of glaucoma, there is a need for early diagnosis, long-term follow-up, as well as knowledge in a wide array of medical and surgical skills. It seems highly unlikely that these skills can be met on a consistent basis on a background of general ophthalmology, thereby making the need for glaucoma subspecialty experts, especially in low- and middle-income nations, even more evident.

Contemporary fellowships in Glaucoma concentrate on a broad educational experience that includes all types of Glaucoma, highly supervised high-volume surgical training, with relevance to trabeculectomy, Glaucoma drainage devices, cyclodestructive surgery, and MIGS. Other essential learning domains are in research methodology, audit, as well as trial participation, which cumulatively enhance evidence-based practice as well as research capacity.

Although many established fellowships in glaucoma are still mostly in developed countries such as the UK, USA, Europe, and Australia, some developing nations have begun to develop tertiary eye centers with expert training programs in glaucoma. Although fellowships are essential learning experiences abroad, they are still hampered by cost factors, lack of visas, as well as other issues. The importance of fellowship training within a certain region has thus significantly increased, as this fits in with the disease prevalence and availability.

The impact of fellowship training on the delivery of glaucoma services is evident in workforce research. Among the over 1,500 actively practicing glaucoma surgeons, only about 20% of these were fellowship trained, but they delivered a significantly increased level of glaucoma services.[5] More importantly, they performed a significantly increased number of different types of surgeries than the non-fellowship-trained ones. The non-fellowship-training individuals mostly ended up with specializing in carefully chosen minimally invasive procedures, while the fellowship-trained individuals addressed complicated cases requiring filtering surgeries, drainage, and similar types of interventions. This clearly indicates that fellowship training is not merely an academic requirement but also one of the most essential factors that define the delivery capacity of services.

The last decade has been encouraging for the growth of ophthalmic subspecialties, with the development of several training hubs in Pakistan. The acknowledgment of Glaucoma as a subspecialty by the College of Physicians & Surgeons Pakistan in 2024 is a significant milestone, with a few tertiary care facilities already recognized for Glaucoma training. Nonetheless, a lot remains to be improved. Glaucoma surgeries with high case volumes, supervised trabeculectomy, Glaucoma drainage devices, and MIGS/S are yet limited to a handful of institutes. There is an urgent need for increased training slots, development of trained faculty, and enhancing capacity. Heterogeneity in Glaucoma exposure during residency training still exists, which is bound to decrease with the induction of trained Glaucoma subspecialty workforce, with fellowship training becoming the norm.

In conclusion, glaucoma is a challenge not only within the realm of clinical practice but also in respect to the preparedness of healthcare systems. The development of glaucoma from a vague condition to a complicated one, involving a chronic form of optic neuropathy, has been, in a way, equaled by the development in learning needs. The acknowledgment that glaucoma is a subspecialty is, therefore, a giant step; now, commitment from learning institutions, professional societies, as well as policymakers, is necessary for this acknowledgment to translate into developing healthcare workforce capacity.

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