Bilateral Xen® is Used as Minimally Invasive Glaucoma Surgery for Glaucoma in GAPO Syndrome: Case Report

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ABSTRACT

The GAPO syndrome is a rare congenital disease that includes growth retardation (G), alopecia (A), pseudo-anodontia (P), and progressive optic atrophy (O). Glaucoma is a well-known disorder reported in GAPO cases. A 36-year woman, a previously diagnosed case of GAPO syndrome, has been followed up in our glaucoma clinic with primary open-angle glaucoma since 2012. In this report, we present her case which underwent XEN® gelatin micro-stent implantation in both eyes at two-week intervals because of uncontrolled primary open-angle glaucoma on medical therapy. To the best of our knowledge, this is the first patient with GAPO syndrome who underwent XEN® gelatin implantation *via* minimal invasive glaucoma surgery (MIGS). The MIGSs are proper options in GAPO syndrome with primary open-angle glaucoma resistant to medical treatment.

Key Words: *GAPO syndrome, Primary open-angle glaucoma, Minimally invasive glaucoma surgeries, Micro-stent*.

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INTRODUCTION

The GAPO syndrome is a rare congenital progressive disorder that includes growth retardation (G), alopecia (A), pseudo-anodontia (P), and progressive optic atrophy (O).[1]

Glaucoma is a well-known disorder reported in GAPO cases.[1,2] Similar to all other features observed in this syndrome, it is believed that the excessive accumulation of connective tissue elements in the trabecular meshwork with an increase in extracellular connective tissue and irregularly-shaped elastic fibres leads to the loss of trabecular cells and the development of primary open-angle glaucoma (POAG).[3]

In recent years, minimally invasive glaucoma surgeries (MIGSs) have gained increasing popularity due to their low complication rates and minimal tissue disruption.[4] With the *ab interno* MIGS procedure, (istent, Hydrus Micro-Stent, Cypass Micro-Stent, and XEN gel stent) the trabecular outflow is increased and intraocular pressure (IOP) control is achieved through bypassing the trabecular meshwork, in line with classical methods (trabeculectomy, aqueous shunts). However, unlike classical methods, the low risk of sub-conjunctival fibrosis and fewer complications provide significant advantages.[4]

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In this case, XEN implant was used, which could be implanted *ab interno* without the need for conjunctival dissection and bypasses humour aqueous *via* the non-pigmented trabecular meshwork.[5] The XEN® implant (Allergan Inc., Irvine, CA, USA) is a 6-mm hydrophilic collagen tube with lumen size of 45 µm, which is designed to provide controlled outflow at the rate of 2-2.5 µL/min and can be applied with *ab interno* approach through anterior chamber angle directed to sub-conjunctival space by means of the same working principle as trabeculectomy (Figure 1).[4]

In the current study, we present a patient with GAPO syndrome and POAG who underwent MIGS through XEN® implant.

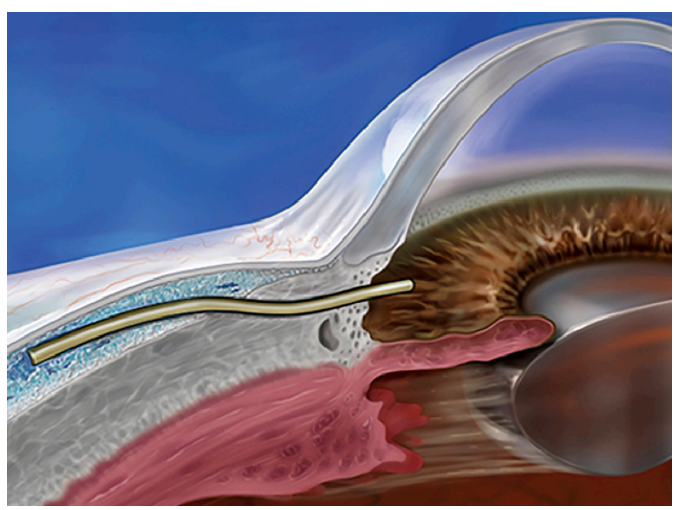

Figure 1: Placement of the XEN® gelatin implant (subconjunctival area - transscleral area - anterior chamber).

Figure 2: Frontal (A, B) and lateral (C, D) appearances of the patient. Note the geriatric face, macrocephaly, hypotrichosis, loss of scalp hair, bossed forehead, thickened eyebrows and eyelids, telecanthus, depressed nasal bridge, anteverted wide nostrils, and thick lips.

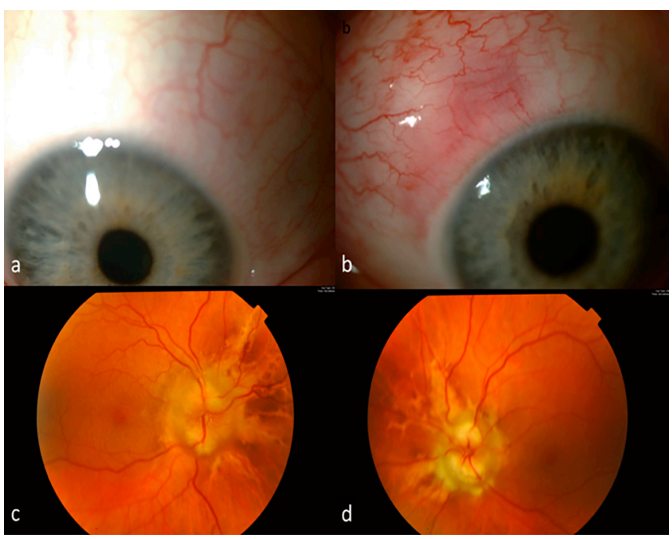

Figure 3: Slit lamp anterior segment (A, B) and fundus photographs (C, D) of the patient. (A-B) Postoperative subconjunctival placement of XEN® gelatin implant is shown in the right eye (A) and the left eye (B). (C-D) Optic disc and fundus appearance, right eye (C) and left eye (D).

CASE REPORT

A 36-year woman was examined at the glaucoma clinic with elevated IOP in 2012. In the physical examination, she was 44.5 kg in weight and 131 cm tall. She was short and stocky and had a geriatric face, bright blue iris colour, alopecia, frontal bossing, high forehead, apparent supra-orbital and forehead ridges, hypertelorism, thickened and protruding upper eyelids, depressed nasal bridge, small mandible, low-set ears, long philtrum, coarse lip vermilion, and micrognathia (Figure 2).

During the patient's first visit, the best corrected visual actuality (BCVA) was 0.00 logMAR in her right eye (RE) and 0.10 logMAR in her left eye (LE). The IOP measured by Goldman applanation tonometry was 29 mmHg in RE and 32 mmHg in LE. Moreover, the central corneal thickness was 539 µm in the RE and 553 µm in the LE. Gonioscopy revealed bilateral grade 4 open iridocorneal angles based on the Schaffer grading scale. Fundus examination showed bilateral myelinated retinal nerve fibres around pale optic discs, posterior staphyloma-like appearance, and normal retinal periphery (Figure 3). Retinal nerve fibre layer (RNFL) thickness (RTVue-100 5.1 Fourier-domain OCT-Optovue Inc., Fremont, California, USA) was found to be normal, and the visual field testing (Humphrey Field Analyzer, Carl Zeiss Vision, USA) revealed paracentral scotoma and bilateral nasal step. Thus, the topical latanoprost was prescribed and follow-up visits were scheduled. In 2017, increased IOP values and RNFL loss progression were observed. The treatment was switched to a combination of dorzolamide / timolol twice daily. The IOP remained stable around 19-20 mmHg; however, the IOP was elevated up to 30 / 32 mmHg in RE and LE, respectively, in 2020. Thus, MIGS was recommended to the patient at this point. The patient then underwent XEN® micro-stent implantation under intracameral anaesthesia in both eyes at two-week interval. The syringe containing XEN® micro-stent was advanced at an angle to the unpigmented trabecular meshwork by entering the anterior chamber from the inferotemporal region. Subsquently, when the syringe was advanced parallel to the iris plane, it was removed through the sub-conjunctival area 3 mm behind the limbus (Figure 1). No intraoperative or postoperative complications were observed (Figure 3). The visual acuity, RNFL thickness, and visual fields remained stable, and IOP <18 mmHg was recorded over the latest follow-up at three years.

DISCUSSION

Overall, 30 cases of GAPO syndrome have been reported in the literature so far. Autopsy studies have shown the accumulation of extracellular homogenous amorphous hyaline material in skin, serous membranes, and several organs.[6]

The ocular findings reported in the literature include band keratopathy, interstitial keratitis, megalocornea, keratoconus, thickened and protruding upper eyelids, white eyelashes, hypertelorism, telecanthus, ptosis, nystagmus, strabismus, glaucoma, papillary oedema, and abnormal response pattern to visual stimulation in addition to progressive optic atrophy.[1,2] Although optic atrophy is one of the primary findings in the GAPO syndrome, it could not be detected in all cases.

Glaucoma was detected in all eight cases reported in the literature including this patient.[2] In the previous studies, different surgical procedures were performed for glaucoma in patients with GAPO syndrome. In 2019, Genc *et al*. reported hypotonic maculopathy with macular choroidal folds, retinal vascular tortuosity, and swelling in the optic nerve following a trabeculectomy of a 42-year man with GAPO syndrome who was the sibling of this patient.[6]

In this case, we described a patient with GAPO syndrome who had uncontrolled POAG on medical therapy. As a result, surgical treatment indications emerged. Recent innovations in the MIGS, low complication rates, and minimal tissue disruption have prompted us to consider MIGS as a treatment strategy for this patient with uncontrolled and progressive POAG.[4] Although the risk of complications is greatly reduced with MIGS procedures, still rare complications can occur such as implant malposition, anterior chamber bleeding, transient hypo-tony, and shallow anterior chamber.[7]

In conclusion, POAG can occur in GAPO syndrome. To the best of our knowledge, this is the first patient with GAPO syndrome who underwent XEN® gelatin implantation *via* MIGS. MIGS is a proper option in GAPO syndrome with POAG unresponsive to medical treatment or having contraindications.

PATIENT'S CONSENT:

An explicit consent has been obtained from the patient to publish this case.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

ME: Study supervision, conception, study design, collection, and interpretation.
CT: Conception, study design, data collection, interpretation, analysis, drafting, and revision.
EB: Conception, study design, data collection, and interpretation.
All authors approved the final version of the manuscript to be published.

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