SCHLEMM’S CANAL SURGERY

It is hoped that the new interest in Schlemm’s canal surgery, now rekindled, will continue to grow

by Clive Peckar

Early attempts to open Schlemm’s canal and allow direct drainage of aqueous, via the collector channel drainage system, using an ab-interno approach, goniotomy/trabeculectomy (Otto Barkan, 1956), or by opening the canal ab-externo and “cheese-wiring” the inner wall of Schlemm’s canal with a nylon suture (Redmond Smith, 1960) or by trabeculectomy (Cairns, 1968) failed; as the openings so created healed. Trabeculectomy carried out with a loosely sutured flap, however, became adopted as a “bleb-dependent sub-conjunctival fistularising procedure”, replacing Holth’s procedure (1909) and Scheie’s procedure (1958).

Interest in Schlemm’s canal surgery then became dormant, until Robert Stegmann, in 1991, working with African patients, in whom trabeculectomy had a very low success rate, successfully developed his technique of visco-canalostomy1. In this procedure he approached Schlemm’s canal ab-externo and dilated it, in part, with high viscosity sodium hyaluronate, while by-passing the trabecular meshwork, using a “trabeculo-descemetical window”, ± micropunctures, and an intra-scleral reservoir/“lake”. In 2004 he improved his technique further, introducing “canaloplasty”, in which he dilated 360° of Schlemm’s canal, using a 250µ microcatheter, developed from arterial catheterisation technology, prior to holding it open, with a 10/0 polypropylene suture.

This technique was further refined, in 2008, with the introduction of 9mm polymide “canal expanders”. Canaloplasty thus became the first physiological surgical procedure, for open-angle, angle recession and congenital glaucoma, which bypassed the trabecular meshwork, and angle, and prevented canal collapse, by dilating and holding open Schlemm’s canal and its ostia, together with those of the collector channels, allowing aqueous to drain directly into the aqueous veins. Whilst these procedures have been increasingly adopted by glaucoma surgeons in many parts of Europe, and the US, they have not been taken up universally due to the relative technical difficulties of the procedures and the perception that they are “not cost-effective”. Interestingly in Germany, where canaloplasty is available through the public healthcare system, it has been demonstrated to be more cost-effective than trabecuclectomy2, when the number of interventions and hospital/clinic visits are taken into account, and to have a better Quality of Life, and greater patient satisfaction, than trabeculectomy3.

Another objection to the use of intracanalicular stents has been that they will be occluded by fibrosis, as suggested by Peng Khaw in the Cover Story (see page 4). This comparison with other “tube” procedures does not take into account the fibriinolytic activators present in the endothelial cells of Schlemm’s canal, its collector channels and aqueous veins, all of which have higher levels of tissue plasminogen activator (t-PA) and lower levels of t-PA inhibitor, compared with vascular endothelium4. It is these activators combined with the fibriinolytic action of sodium hyaluronate that is, in part, responsible for the surgical success of visco-canalostomy5 and canaloplasty6.

In the Cover Story of this issue (see page 4) we examine the views of a number of glaucoma surgeons on the development of MIGS (Minimally Invasive Glaucoma Surgery) and highlight some of the recent devices which allow aqueous direct access into Schlemm’s canal. Canal surgery performed with the MIGS ab-interno approach, under gonioscopic vision, has many theoretical advantages and avoids the difficult ab-externo dissection and suturing.

However, although the early results using these devices have been encouraging, it should be noted that many of these early studies were combined with phacoemulsification, which alone significantly reduces intraocular pressure (see article page 8), and longer term studies, which also exclude the confounding effect of phacoemulsification, will determine how effective these newer devices are, and whether they can be inserted sufficientlyatraumatically, without pre-dilating the canal, to prevent fibrosis. It is hoped that this new interest in Schlemm’s canal surgery, now rekindled, will continue to grow.

References:

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