

**? Should there be a larger Role for the
Suprachoroidal Space in Glaucoma
surgery.**

Dr Henry R Lew MBBS FRACS FRANZCO

In view of the fact that

**Prostaglandins and CyPass which
both use the suprachoroidal space
lower pressure better than other
drops or MIGS.**

**The Topic is: Combined
Trabeculectomy/Cyclodialysis
with Healon retained
& AUGMENTED with
5FU**

**“INFLUENCES &
INNOVATIONS”**

**This is a study of 55 eyes in 32 patients
(1987-2012).**

**A further 200+ public hospital cases were
unaccessible due to new privacy laws
introduced circa 2000.**

**A CPD Surgical Audit for 2012 became:
An article in Journal of Glaucoma for
January 2015,**

**(which was listed by MD Linx
Ophthalmology as #1 of 20 best papers in
64 journals worldwide for that month).**

1958

Dr. Harold Scheie (Philadelphia, USA)

introduced Scheie's Operation for Glaucoma

A small full thickness hole at the corneal limbus allowed drainage of aqueous into the sub-conjunctival space under a limbal based conjunctival flap.

Many cases were successful, but the procedure was associated with a significant incidence of hypotonous flat anterior chambers, corneal decompensation, formation of peripheral anterior synechiae, induced subsequent cataracts and large choroidal detachments.

1968

Dr. J. E. Cairns (Cambridge UK)

introduced Trabeculectomy.

The concept was to perform a Scheie's like deep opening, but this time under a protective overlying larger superficial partial thickness scleral trap door, to reduce flow into the sub-conjunctival space, and, in so doing, reduce the incidence of hypotonous flat anterior chambers, corneal decompensation, formation of peripheral anterior synechiae, induced subsequent cataracts and large choroidal detachments.

1976

Dr. Bill Gillies,

during his TRABECULOTOMY procedure, identified direct openings into Schlemm's Canal in the side walls of his deep open trapdoors - passed a probe into one of them - and then rotated it into the anterior chamber. This was associated with a high incidence of hyphaema.

I realised that a deep open trapdoor in trabeculectomy offers 2 direct plumbing aqueous escape passages, by by-passing trans-cellular enzymatic entry into Schlemm's canal, (versus Scheie's procedure, which provided only a single escape passage into the sub-conjunctival space).

1977

Dr. Peter Hardy-Smith,

DURING TRABECULECTOMY,

removed a triangle from centre of the posterior lip of his superficial trapdoor.

He said, “This encourages posterior aqueous drainage!”

It seemed a good idea, so I started to open up posterior tunnels on both sides of the superior rectus muscle, similar to when mobilising extra-ocular muscles in strabismus and retinal detachment surgery.

1978

Dr. Brian Harcourt (Leeds UK)

“I have put a West Indian gentleman on your operating list for trabeculectomy.

Their healing response is much stronger than in Caucasians and the procedure is much more likely to fail.”

During this case

**I 'INADVERTENTLY' created an
'OPENING INTO THE SUPRACHOROIDAL SPACE'.**

3 weeks post-op there was no bleb and a pressure approaching 30 mm Hg. High dose oral and topical steroids were ceased and the patient brought back 2 weeks later for final pressure analysis before recommencing topical treatment.

Pressure was 12 mm Hg and remained so during the rest of my stay in Leeds (March 1978 – September 1979).

**Conclusions: Patient was draining through the cyclodialysis and steroids hinder drainage through natural pathways and cyclodialyses. I have had these feelings reinforced numerous times over the next 36 years, when routinely performing:
Combined Trabeculectomy/Cyclodialysis.**

So from 1978 - 2014

Dr. Henry R. (Harry) Lew

started routinely performing combined trabeculectomy/cyclodialysis to establish direct plumbing connections, which by-pass natural enzymatic trans-cellular pathways, not only maybe into Schlemm's Canal, but also into the uveo-scleral pathway as well.

This enabled the possibility of 3 direct plumbing escape pathways for aqueous fluid rather than the possible 2 routes previously available.

Circa 1984-5

Dr. Robert Stegmann (South Africa), visited Australia to invite surgeons to use Healon in Cataract Surgery and in reforming flat anterior chambers after Trabeculectomy:

He said: “The FDA in USA (1983) only approves use of Healon in eye surgery provided it’s removed from the eye at the end of the procedure, because it causes severe glaucoma. This is true for cataract surgery, but is not the case when reforming flat anterior chambers post-trabeculectomy.”

A few weeks later

Dr. Ken Gullifer (Melbourne)

- a close friend and colleague -

phoned me:

“I used Healon to reform a flat anterior chamber post-trabeculectomy. The next morning the anterior chamber was deep and the pressure was low.”

About a week later still

I reformed a post-operative flat anterior chamber with Healon. They were not uncommon in those days.

The next day the anterior chamber was the deepest I had seen on day 1 and the pressure was low.

I rang Pharmacia in Sweden to ask to speak to one of the scientists who had helped develop Healon.

The Scientist said:

“The biochemical structure of Healon resembles chicken wire and water molecules are small enough to easily flow through the holes in the chicken wire.

Healon blocks flow through normal enzymatically controlled trans-cellular outflow pathways, but if there is a surgically created drainage hole in the eye, water molecules will flow through the Healon and out the hole.”

From circa 1984-5 onwards

I routinely left Healon in the anterior chambers of all my combined trabeculectomy/cyclodialysis cases.

Since then I have had:

(1) No serious hyphaemas.

(2) Deep anterior chambers on Day 1 in every case bar one. That one shallow but not flat case resolved spontaneously in 48 hours.

(3) No large or threatening choroidal detachments. Even small choroidal detachments were rare and rapidly resolved.

1989

Queensland Meeting

Professor Roger Hitchings (London, UK):

announced that Moorfield's Eye Hospital had started using 5FU as an enhancing agent in all re-do trabeculectomies.

I decided to do a trial using 5FU in primary procedures, as I did not do many re-dos.

1991

Queensland Meeting

I presented a teaching film of my combined trabeculectomy/cyclodialysis technique with 5FU made through the Dept. of Surgery, Melbourne University (1990),

together with a study prepared in collaboration with a Melbourne University statistician, which showed that 5FU had lowered my post-operative pressures from an average of 15 to 10 mm Hg and that the fall was statistically significant.

Circa 1991-2

I changed my conjunctival flap suture technique from:

1 x continuous 10/0 nylon suture along the whole length of the wound to:

2 x continuous 10/0 nylon sutures starting at each end and made to cross at the midline prior to tying.

This was thanks to Dr. Michael Coote, my first registrar to routinely do Seidel Tests on my day 1 cyclo/trabs, despite the fact that they were the deepest A/Cs he had ever seen.

Mid-1990s

Mitomycin started to replace 5FU as an enhancing agent in trabeculectomy,

and with the higher doses used then was more commonly associated with post-operative infective endophthalmitis than 5FU. I have never had a post-operative infection with 5FU.

I did an extensive literature search on 5FU and discovered that from all the anti-metabolites 5FU had the most anti-biotic activity and was particularly effective against organisms that commonly infected eyes.

Late 1990s – Early 2000s

By now Professor Peng Khaw's technique employing a fornix based flap, mitomycin, an anterior chamber maintainer and releasable sutures was starting to gain widespread popularity.

I attended several lectures given by Professor Khaw himself but could not convince myself that his results were any better or safer than my own.

I therefore continued performing combined trabeculectomy/cyclodialysis until I retired from surgery in 2014.

Ocular Surgery News

Europe/Asia Edition

October 2000

Dr. Corinna Buhler MD (Sulzbach, Germany):

“Study (presented at ASCRS Boston 2000) shows not removing intraocular viscoelastic after trabeculectomy lowers postoperative complications”

“The advantage of this technique is the maintenance of the anterior chamber during and after surgery, the avoidance of haemorrhages, and better bleb formation due to the viscoelastic being washed out of the anterior chamber.”

Ocular Surgery News USA Edition

June 2001

Europe/Asia Edition

September 2001

“Surgeon: leave Healon in chamber for safer trabeculectomy.”

“Viscoelastic in the anterior chamber is one part of an innovative approach to trabeculectomy that surgeon Henry Lew MBBS, FRANZCO, FRACS, (Melbourne, Australia), has evolved over the past 15 years.”

(My personal Andy Warhol’s “EVERYONE HAS 15 MINUTES OF FAME,” as an ophthalmic surgeon.)

2010

Professor Johnathan Crowston alerted me to:

(1) Sihota R, Srinivasan G, Gupta V.

Ab-externo cyclodialysis enhanced trabeculectomy for intractable post-penetrating keratoplasty glaucoma. *Eye (Lond)*. 2010;24:976-979.

&

(2) suggested I audit my own results.

Shortly afterwards Dr. Mark Walland likewise suggested I audit my own results.

May 2013

ARTICLE (ORIGINAL STUDY) :

**Surgical Outcomes of Combined
Trabeculectomy/Cyclodialysis for Glaucoma (over a
25 year period),**

**Simon E. Skalicky MBBS, MPhil, MMed (*Ophthal Sci*),
& Henry R. Lew FRANZCO, FRACS.**

**Accepted for publication Journal of Glaucoma
(January 2015).**

**For a more detailed, more conventional analysis of
the results expressed in the following slides please
consult this paper.**

The entire 55 eyes

Prior to surgery:

25.89 mm Hg on 2.18 medications.

After surgery:

10.76 mm Hg on 0.64 medications.

Average pressure drop 58.44%

Average reduction in medications 70.64%

Average follow-up 10.79 years.

With Healon retained 1987-1989 (7 eyes)

Prior to surgery:

27.42 mm Hg on 1.43 medications.

After surgery:

15.00 mm Hg on 1.29 medications.

Average pressure drop 45.29%

Average reduction in medications 9.79%

Average follow-up 22.85 years

**With Healon retained and 5FU (1989 onwards).
Mitomycin was never used.
(48 eyes)**

Prior to surgery:

25.67 mm Hg on 2.29 medications.

After surgery:

10.15 mm Hg on 0.54 medications.

Average pressure drop 60.46%

Average reduction in medications 76.42%

Average follow-up 9.03 years.

Two cases of Low-tension glaucoma

Prior to surgery:

12.00 mm Hg on 3 medications.

After surgery:

5.00 mm Hg on zero medications.

Average pressure drop 58.33%

Average reduction in medications 100%

Average follow-up 2.46 years.

Complications

Post-operative needling: 1 case (2.08%)

Excision of cystic blebs: 2 cases for maculopathy (4.17%)

#1
39 mm Hg on 3 medications in 2000
Bleb revised 2008
9mm Hg on zero medications 2012

#2
27 mm Hg on 2 medications in 1998
Bleb revised 2012
12 mm Hg on zero medications post-op.

No flat anterior chambers, significant hyphaemas, or endophthamitis, until 2012 but one case from 2002 did go on to develop endophthamitis in 2015.

The Endophthalmitis Patient

Annual motor trips to Northern Territory.

Told for 13 years never to swim in water pools there.

2015 – Told to have bleb revision for a cystic bleb, but preferred to delay it until after he returns from his trip.

Swam in water pool 400 km from medical care and got a sore eye 4 hours later.

At that time, ABCTV's Australian Story interestingly reported multiple parasitic meningitic deaths in remote Australia, mainly in children, from unfiltered water accessing nasal mucosa.

Two Final Impressions

(1) The Peng Khaw procedure is probably not really a trabeculectomy. The small anterior hole created with a Descemet's Punch means it is probably a Scheie's procedure under a scleral trapdoor flap. It may work solely by allowing fluid to escape from the anterior chamber to the subconjunctival space; rather than providing 3 possible outlets for fluid to exit the eye.

(2) I have a strong gut feeling based on personal experience and from listening to many Peng Khaw lectures that combined trabeculectomy/cyclodialysis tolerates hypotony better than the Peng Khaw procedure does because hypotonous maculopathy seems less of an issue in eyes with low pressures. Whether this may relate to different fluid dynamics inside the eye - *(in Peng Khaw's procedure the hypotony may be solely due to fluid gushing out of a single hole)* - or whether this relates to Mitomycin - or both - still remains to be seen.

In Defence of Limbal-based Flaps

The Peng Khaw “Ring of Steel” is not necessarily a universal feature of limbal-based flaps. It occurs most frequently where conjunctiva posterior to the incision line is not adequately mobilised.

If the posterior conjunctiva is mobilised by creating far-reaching posteriorly directed tunnels on each side of the superior rectus muscle - and these tunnels are filled with Healon - the “Ring of Steel” is much less of an issue.

**Right & Left Eyes of same patient
looking downwards.**

The right eye has no “Ring of Steel”.

**In the left eye the “Ring of Steel” is confined to in
front of the anterior insertion of the superior
rectus muscle, but is absent in front of the
posteriorly directed conjunctival tunnels on each
side of it.**

