

Open Patient Meeting

- Glasgow -

Explaining Glaucoma

Dr Donald Montgomery Glasgow Royal Infirmary

I spend most of my working life dealing with patients with glaucoma-related problems but it's a continual frustration that we're often so pressed for time in the clinic that communication isn't always as effective as it should be. You know that works both ways, as patients are often reticent about asking questions, not wanting to trouble the busy doctor. Then we're pulled-up short when a patient, who's been attending the clinic for several years, will finally summon their courage and ask, rather apologetically, "what actually is glaucoma?" "What do you mean by pressure?" So in the next 20 minutes I'm going to try to explain what glaucoma is; how we treat it; and what advances may be on the horizon.

So what is glaucoma? Perhaps the first thing we have to make clear is that glaucoma is a word that we use to describe a whole range of conditions that can affect the youngest child to the oldest adult and can take many different forms. It can be a sudden onset painful condition or, as is much more common, it can be a slow and insidious condition without any symptoms until late in its course – the so-called-thief of sight. So what do all these different conditions

have in common in order for us to refer to them all as glaucoma? Well to explain that we need to learn a little bit about the eye. We often say that the eye resembles a camera. At the front there is the focusing part, the cornea and the lens and this causes an image of the outside world to be formed on the retina, which corresponds to the film in an old fashioned camera. The retina then converts this image into electrical signals that are then carried along to the brain through a large optic nerve.

Now when your eye doctor or optometrist looks into your eye, he can see the optic nerve as it leaves the eye, where it forms what we call the optic disc. Here is an example of a nice healthy optic disc (Figure 1).

So to return to our question, what is glaucoma? It's a group of diseases that damage the optic nerve in a particular way (Figure 2). Here you can see that the rim that contains the nerve fibres is thin and withered. There's even a little bruise forming at the edge showing that the nerve is the worse for wear. What this means is that your sight is damaged and, because this damage affects your side vision first, you have the common,

Open Patient Meeting

- Glasgow -

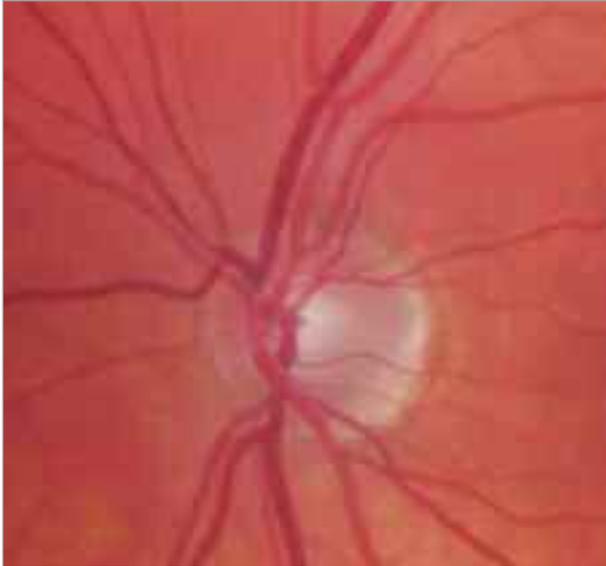


Figure 1

gradual and painless form of the disease and are unlikely to even realise that you have a problem. This is why regular eye tests are so important, especially in older age when as many as one in 20 people may be affected. Here is a simulation of what it's like to have glaucoma (Figure 3). It's not what we

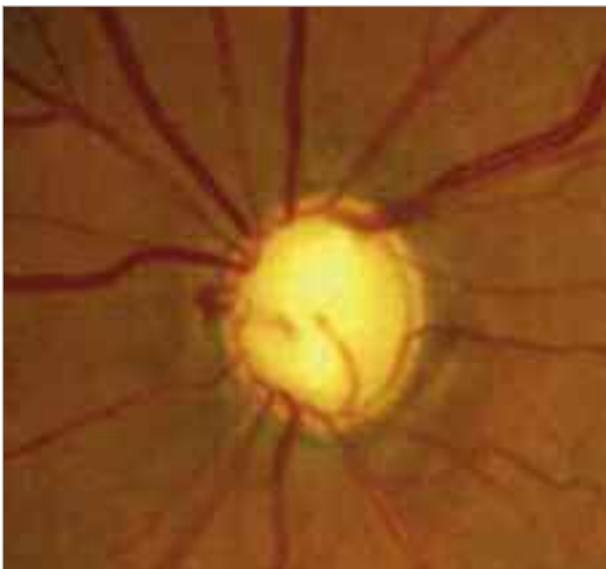


Figure 2

see, but what we don't see that's important.

So what causes this damage to the optic disc? To be honest, we don't know the full answer to this, but we do know that pressure within the eye plays an important part. What do I mean by pressure? Well those of you who are motorists know that it's important to maintain your tyres at the correct air pressure. This is because too low or too high a pressure will cause damage to the tyre as well as reducing your fuel efficiency and may even be unsafe.

There is a correct pressure that will allow that particular tyre to function properly. Returning to the eye, it also must be, as it were, inflated to the correct pressure and it does this by producing a small but steady amount of fluid from this tissue behind the pupil. This fluid then passes through the pupil and escapes from the eye at just the right rate so that the eye maintains, what we might call, a healthy firmness that allows the eye to function. What happens in glaucoma is that the optic nerve develops a vulnerability to the pressure inside the eye and begins to show damage. In many cases of glaucoma there is clearly a problem with the way fluid escapes from the eye and the pressure is raised.

However we also, very often, encounter eyes that appear to have become vulnerable to what appear to be normal levels of pressure.

Open Patient Meeting

- Glasgow -

Figure 3



Normal Vision



Mild Affect



Advanced Effect

Open Patient Meeting

- Glasgow -

So how do we treat glaucoma once it's been discovered? Well ideally we would like to have a way of healing the optic nerve. But at the moment this isn't possible. Perhaps we could find a way of protecting the nerve, to strengthen it and make it more resilient and less vulnerable to ongoing damage. Well different things have been tried, but so far without any success. There is one thing, however, that has been proven to be effective in slowing the progression of glaucoma and that is to lower the pressure in the eye – and this applies to whether the pressure began very high, just moderately high or even at an apparently normal level, we must get the pressure lower. So how is this to be achieved?

Well firstly we now have a huge range of eye drops at our disposal. These work either by reducing the amount of fluid produced by the eye, or by helping the fluid to escape and so tend to soften the eye. The drugs in these eye drops are very powerful and, perhaps in combination, they will be able to provide adequate lifetime control of glaucoma in around 75% of patients. However there are a number of issues with eye drops, the first being that they only work if they're put into the eye. This may seem a strange statement, but a number of surveys suggest that a surprising proportion of patients don't use their drops as prescribed. (I'm quite sure that this doesn't apply to those of

you here today). This may be due to a number of issues for example, forgetfulness. Elderly patients often have many different drugs to remember to take and don't always find this easy. They may have an inadequate understanding of their condition and therefore don't appreciate the importance of the drops. Some patients give up because they don't notice any difference in their vision. And this will be all the more likely if they experience any unpleasant side effects. Many people have every intention of using their drops regularly but simply find them difficult to put in.

This is my technique: head back; look at a point on the ceiling directly above you and line the bottle up with that; draw the lower lid down to create a little pouch and let the drop fall in; afterwards sit with your eyes gently closed, as if asleep, for about a minute. I sometimes hear patients say that they blink their drops in. In fact all this does is squeeze the drops out. So, eyes gently closed and at the same time gently compress the soft tissue at the base of the nose (Figure 4).

This will reduce the amount of the drop that passes into the nose and throat causing an unpleasant taste and possible side effects. Finally, on the day of your hospital check-up be sure to use your drops as normal. I wish I had a pound for every time I've heard a patient say: "I knew you were going to

Open Patient Meeting

- Glasgow -

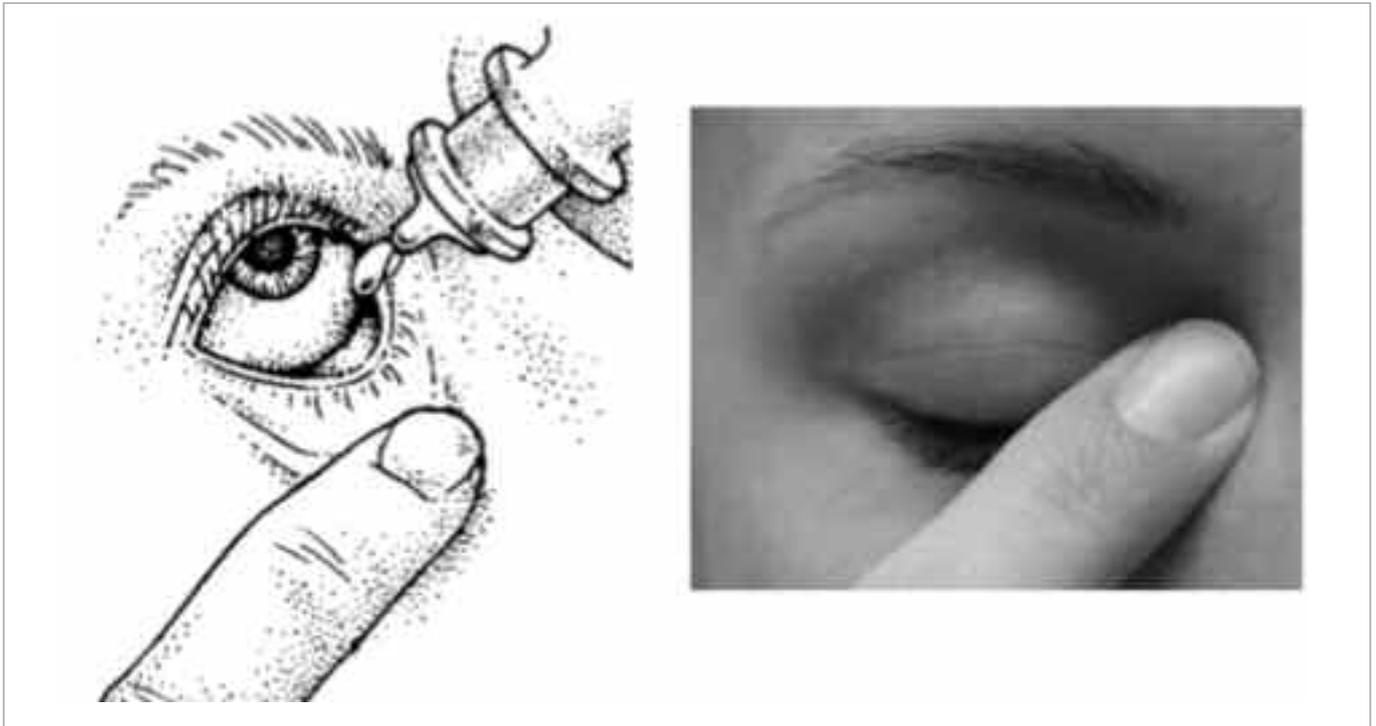


Figure 4

put drops in my eyes when I got here, and I didn't want to do anything to interfere so I didn't put them in today." Many of the eye drops only work for 12 hours so if you don't use a drop that you normally put in in the morning, your doctor will be unable to say whether or not they are working.

So eye drops will allow adequate lifelong control of glaucoma in 75% of patients. This does mean that for 25% of patients other measures will sooner or later be required and that usually means surgery. The operation that we usually carry out is called a trabeculectomy and this lowers the eye pressure by creating a small drainage channel through the wall of the eye (Figure 5). In a few cases where this has

been previously tried but failed we may decide to put a valve into the eye (Figure 6). And in rare cases where this doesn't work we can use a laser to shrink the tissue that produces the aqueous fluid. This can be a bit unpredictable with the danger that the eye becomes too soft, so this tends to be treatment of the last resort.

Hope for the future

So we already have a whole range of treatments that will allow us to preserve sight in the great majority of patients with glaucoma. But what about new developments in treatment that might enable us to do even more?

Open Patient Meeting

- Glasgow -

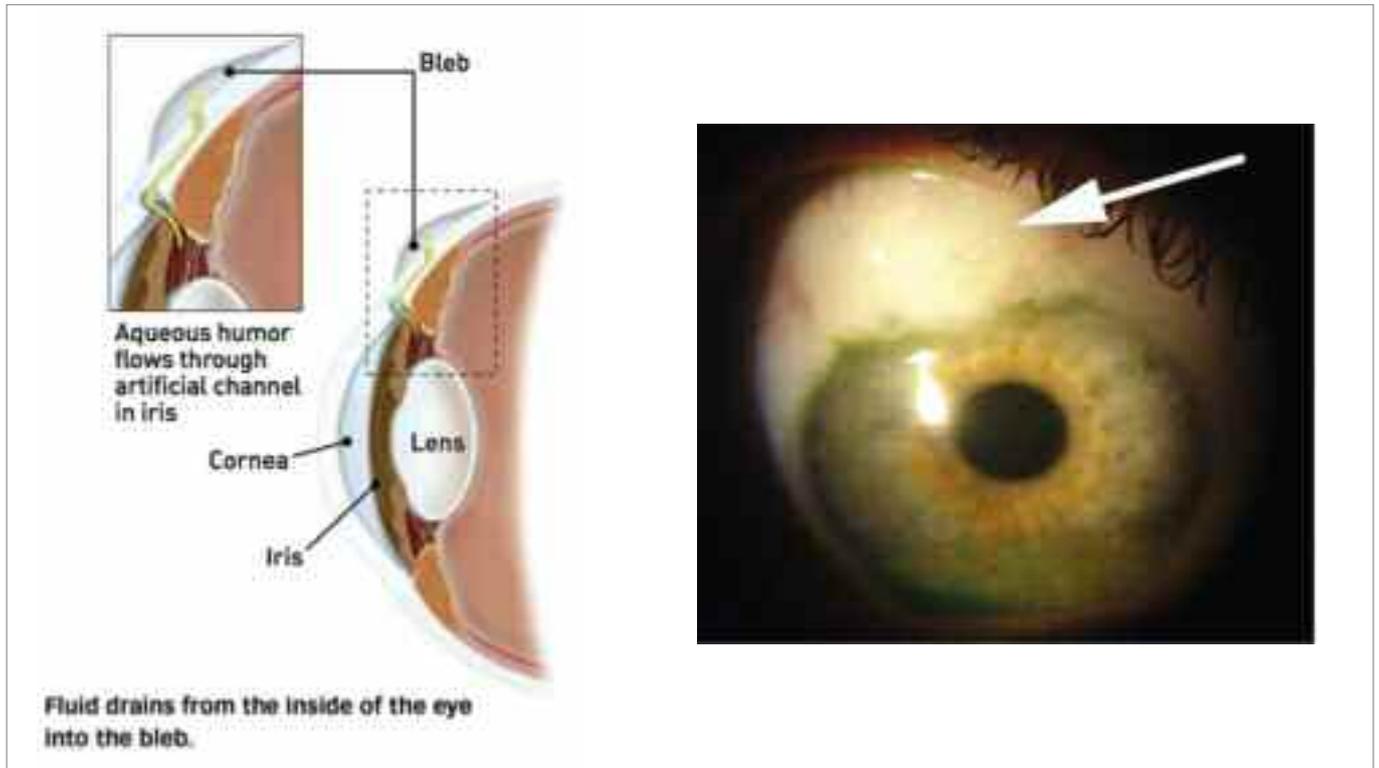


Figure 5



Figure 6

Open Patient Meeting

- Glasgow -

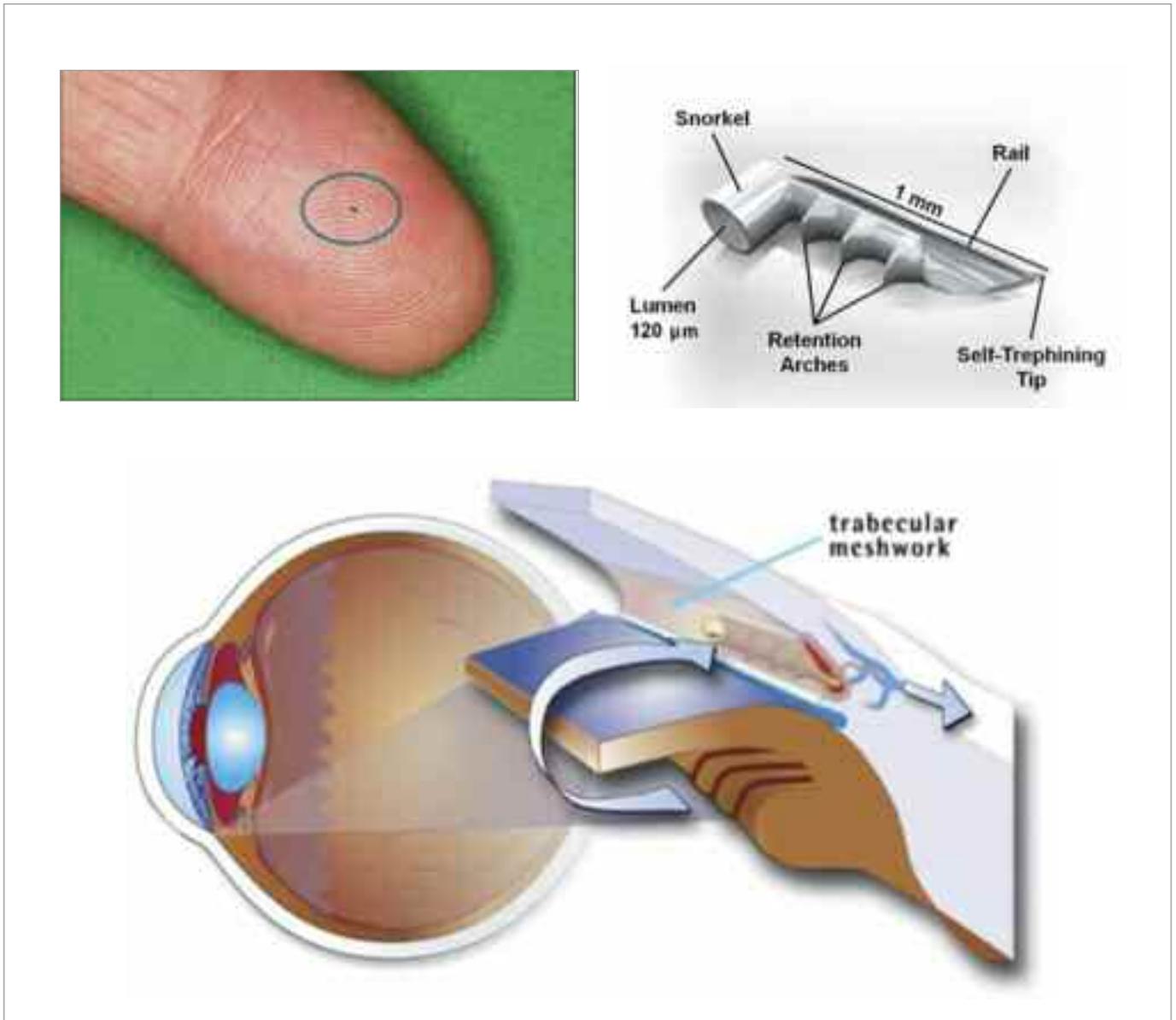


Figure 7

Well we already have many very effective drugs, with some new ones on the horizon, but wouldn't it be great if we didn't have to rely on the daily use of eye drops to get them into the eye? Perhaps that day won't be too far off.

Amer Sawhney is an American innovator and entrepreneur whose

company has developed a new way of delivering drugs to the eye. It's a little plug that can be placed just inside the tear duct. When a drop is put into the eye it will absorb the drug and release it slowly and steadily over a two-month period.

Open Patient Meeting

- Glasgow -

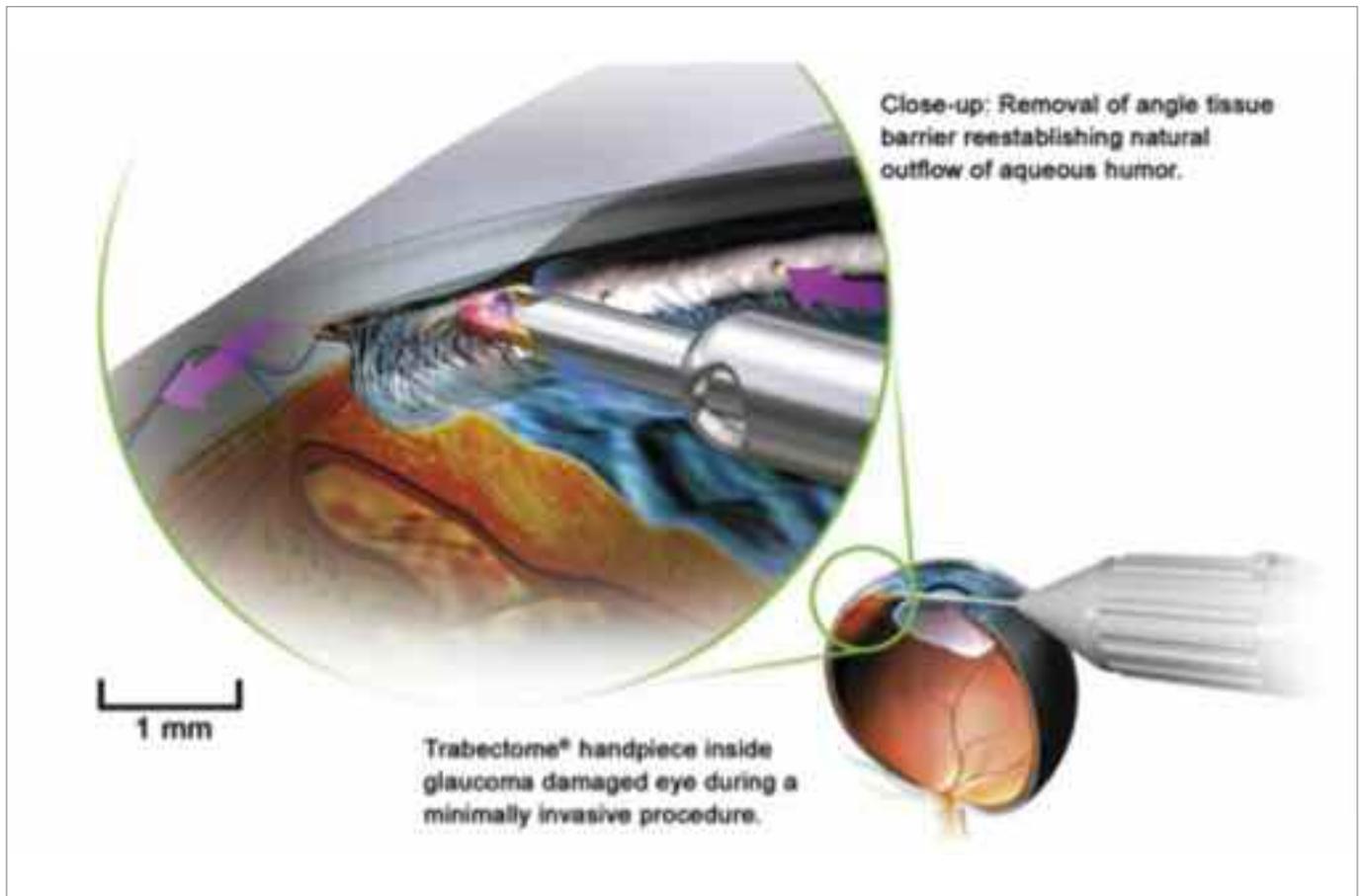


Figure 8

There are also new surgical procedures that are undergoing trials in different parts of the world. Here is one such procedure that involves the smallest surgical device ever to have been implanted in a human being. There it is on the tip of a finger (Figure 7). It measures 1mm in length. Using an introducer it can be implanted inside the eye so as to bypass the drainage obstruction and so lower the eye pressure.

Here is another approach that uses a tiny electrical cutter to remove the

obstructing tissue (Figure 8). We also have new laser treatments. The long-term effect of these operations have still to be established but they may well prove to be useful additions to the treatments we already have.

But here is the million dollar question. It's all very well to slow the progression of glaucoma by lowering the eye pressure, but what about patients who have already lost sight? Can we envisage the day when there could be a cure for glaucoma? This is a huge challenge because it would involve regenerating

Open Patient Meeting

- Glasgow -

the optic nerve with all its intricate connections. Only a few years ago this sounded like science fiction. However great strides are being made in stem cell research – not least by this scientist and her London-based team. Professor Limb has stated that it's her ambition to establish a stem cell treatment for glaucoma and to see the first patient benefit before she retires. So perhaps during the next decade, and hopefully before I finish my career, we might see this coming to fruition.

Dr Donald Montgomery

Glasgow Royal Infirmary

