Descemet's Stripping Automated Endothelial Keratoplasty – DSAEK

DSAEK is a new type of partial-thickness corneal graft operation in which only the inner endothelial cell layer is replaced, instead of the whole thickness of the cornea as happens in a conventional full-thickness graft (penetrating keratoplasty).

Who is suitable for DSAEK?
The operation is performed where poor function of the inner endothelial cell layer has lead to corneal water-logging (oedema). Normally corneal transparency is dependent on the endothelial cells pumping fluid out of the cornea. If the cornea becomes oedematous the vision deteriorates. In severe corneal oedema the surface cell layer (epithelium) develops tiny blisters of fluid between the cells (bullous keratopathy), and this causes further visual decline, as well as making the eye intermittently painful when the bubbles burst.

Corneal endothelial failure is seen in the genetically determined condition of Fuchs' corneal endothelial dystrophy, and may also occur following intra-ocular surgery such as cataract extraction.

How is DSAEK performed?
An artificial anterior chamber is used to support the donor cornea whilst it is being cut with a microkeratome (miniature motorised cutting device). The microkeratome skims off the outer layers of the cornea leaving a very thin layer of stromal fibres supporting the inner Descemet's membrane and the endothelial cells. Alternatively, the donor tissue layer can be prepared manually by using lamellar dissectors to split the donor cornea (this non-automated version of the procedure is called DSEK).

Once the donor tissue has been prepared, the patient has their own Descemet's membrane and endothelium removed by being scraped off the back of their cornea. The donor tissue is then introduced into their eye and floated up onto the back of their cornea on a gas bubble.

What are the advantages of DSAEK?
The surface of the cornea is an extremely important component of the optical system of the eye, so any irregularity in the corneal shape has a major effect on visual performance. Because DSAEK only exchanges the inner cell layers of the cornea it has little or no effect on its external shape. This means that the speed and quality of the visual recovery after DSAEK is generally much better than that achieved by a conventional penetrating graft.

What are the disadvantages of DSAEK?
Once the graft has been manoeuvred into position on the back surface of the patient's cornea, in the majority of cases it quickly adheres. However, occasionally in the first few days after the graft has been positioned, it can become dislocated into the anterior chamber. If this happens further surgery is required to reposition the graft with a new gas bubble. Very rarely re-positioning may need to be repeated on more than one occasion. However, once the graft has been attached for a few days it will not become dislocated again at a later stage. In some patients, if their cornea has been damaged by severe oedema, there may be some residual haze or scarring in the corneal tissue which may limit the quality of the visual recovery, even though the corneal oedema has been cleared by the function of the grafted endothelium.

What are the risks of DSAEK?
Corneal donors are screened for infectious diseases including HIV, Hepatitis B and C, HTLV, and syphilis. Because of the very small potential risk of transmission of diseases such as CJD (Creutzfeldt-Jakob Disease), patients having a corneal transplant of any sort are no longer eligible to be blood or tissue donors themselves.

Like other graft operations that use living tissue, there is a potential for corneal graft rejection which can lead to failure of the graft. The donor cornea used in DSAEK is preserved in an eye bank, and the corneal endothelial density is evaluated by microscopy. However, the endothelial cells can be damaged at the time of surgery which may mean that the graft never functions (primary graft failure), or only functions for a while and later fails (late failure from endothelial depletion).

What happens post-operatively?
The eye will be red, sore and watery for a week or two. Initially the vision can be quite hazy whilst the cornea is still oedematous, but should clear as the graft starts to function. If a gas bubble has been left in the eye, the surgeon may ask the patient to keep their eyes looking vertically upwards to help hold the graft in place whilst it sticks. The bubble will be absorbed after some hours or days depending on what type of gas is used. It is important that rubbing of the eye is avoided in the first few weeks to prevent dislocating the graft.

Steroid drops are used to settle the inflammation and reduce the risk of rejection, and may be continued on an indefinite basis. If the patient has some degree of cataract as well as corneal failure, it is likely that the cataract will be made worse by the use of steroid drops post-operatively, and for this reason it is often recommended to remove the cataract either before or at the same time as having the DSAEK graft.

In some patients there may be a problem with a rise of pressure inside the eye (glaucoma) associated with the steroid eye drop treatment, and this may require additional medical or surgical treatment.