

## **PREOPERATIVE OCULAR COMPRESSION FOR CATARACT AND INTRAOCULAR LENS IMPLANT SURGERY**

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Preoperative digital compression was a technique used in intracapsular cataract surgery (era 1940's to 1970's) to "soften" the eye to prevent extrusion or expulsion of intraocular contacts at the time of lens extraction. One technique was to apply finger pressure for 5 minutes after the patient was prepped and draped. Pressure was applied in 25 second increments with 5 second release of pressure to allow or assure central retinal vessel flow.

Excess finger pressure resulted in dislocation of some lenses into the vitreous. Insufficient pressure did not achieve desired results. The amount of digital pressure could not be regulated or standardized. Instrumentation was developed, allowing pneumatic pressure with a bellows device inflated with a sphygmomanometer bulb air pump and monitored by an aneroid manometer. It allowed more precise application of pressure. External compression could then be applied at a predetermined level.

Other less precise devices used were rubber balls strapped to the eye and gravity-dependent bags of lead shot or mercury laid on the eye.

Clinical observations have suggested that intraocular pressure is lower after continuous extraocular compression. After compression at 30mm Hg for 30 to 60 minutes, intraocular pressure has been recorded at 12 to 20 scale reading units with a Schiotz Tonometer with a 5.5g weight.

One of the hazards of intracapsular cataract extraction was expulsion of vitreous. Preoperative ocular compression resulted in soft, safe surgical eyes. After extraction of the lens in its capsule with capsule forceps, erysophake or by Smith expression technique, the vitreous would fall posteriorly and the cornea would exhibit a concave configuration or dimple.

When anterior chamber and iris plane intraocular lenses were introduced, it was important to avoid touching the cornea. Polymethylmethacrylate plastic has a destructive effect on the corneal endothelium. Preoperative ocular compression produced soft eyes with absence of pressure from the vitreous to force the intraocular lens against the corneal endothelium.

Prior to the availability of viscoelastic substances, ocular compression helped to protect the corneal endothelium.

Phacoemulsification instruments have a positive pressure control to prevent the forward protrusion of vitreous and lens-iris diaphragm. Viscoelastic substances can be used to protect the corneal endothelium for surgical maneuvers and lens insertion. Preoperative ocular compression can add an additional safety factor by decreasing the tendency of the posterior capsule to bulge forward during phacoemulsification.

Extraocular compression, following injection of retrobulbar or peribulbar anesthesia, can aid the diffusion of the anesthetic solution. Akenesia is enhanced, thus obviating the need for a separate lid block.

How much pressure and how long should preoperative ocular compression be used? A pressure lower than diastolic pressure should allow adequate perfusion. Continuous pneumatic pressure of

30mm Hg has been applied 30 to 60 minutes by many surgeons for several years. The resulting intraocular pressure at the time of surgery has been a Schiötz scale reading with 5.5g weight of 8 to 20 scale units. One surgeon reported that he has used 50mm Hg pressure for several years with good results and no untoward incidents.

My practice is to use 30mm Hg preoperative ocular compression for 20 minutes for the first case in the morning. The second case is blocked before the first surgery is done and the balloon is applied at a pressure of 15mm Hg for 30 to 60 minutes until it is removed when the surgical prep is done. The Schiötz pressure reading, with a 5.5g weight, is usually 5 to 10 scale units. The eyes are surgically soft and safe.

When general anesthesia is used, the pressure apparatus can remain in place during intubation and removed just prior to the surgical prep. In the 1970's, we used general anesthesia for many cataract surgeries. Extraocular pressure was applied at 20 to -30mmHg for up to an hour. Patients did not complain of discomfort.

When only topical anesthesia is used, we have applied extraocular compression at 30mm Hg for the first case for 20 minutes. On the second and succeeding cases, 15mm Hg is used for 30 to 60 minutes.

How long does the pressure lowering effect last after compression is released? Practically, the duration of action is sufficient to do the surgery safely. Occasionally, a surgery is delayed for some reason and the patient may be on the operating table prepped and ready for surgery for perhaps 30 to 45 minutes. In those cases, there may be a tendency for the lens-iris diaphragm to bulge forward during surgery.

What is the mode of action of preoperative ocular compression? It has been proposed that the lowering of intraocular pressure is due to decreased vitreous volume. It is also theorized that the entire orbital contents are compressed with decrease in orbital volume. Thus, the retrobulbar contents are compressed, so that they do not exert their normal pressure on the globe.

Other benefits of ocular -compression: There are benefits of preoperative ocular compression other than prevention of bulging or expulsion of intraocular contents during surgery. Retrobulbar or peribulbar hemorrhage secondary to injection of anesthetic agents seem to be inhibited by application of compression after injection.

One theory of the cause of subchoroidal hemorrhages during surgery is that fragile vessels are stressed at the time of sudden pressure decrease at the time of incision. Older arteriosclerotic vessels may be more fragile. Lowering the intraocular pressure by preoperative ocular compression decreases the pressure differential at the time of a keratome incision. There may be less stress on the vessels with the lowered pressure differential.

Retrobulbar or peribulbar hemorrhages and subchoroidal hemorrhages, during or following surgery, are very rare. Fortunately, I have not experienced either complication in several thousand surgeries using reoperative ocular compression since the early 1970's.