

THE LIQUID SCAPEL

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NARRATOR:

This is the Liquid Scalpel, part of the hydro-pulse surgical support system.

A hard cataract is being broken up by pulses of saline solution issuing from the tip.

The Liquid Scalpel does not injure soft tissues.

It is being used by Doctor Herbert Katzin at Manhattan Eye, Ear and Throat Hospital.

DR. KATZIN:

"In the eye you have to be concerned about the iris, you have to be concerned about the posterior capsule of the lens, and you have to be concerned about the posterior surface of the cornea. So you want an instrument which is not going to do damage. This is point number one.

"The liquid pulser will hit a hard lens and emulsify a hard lens, whereas hitting a soft piece of material that yields will have no effect."

NARRATOR:

The source of power for surgery is contained in a hydraulic pulser, which may be autoclaved and re-installed. The tip ejects pulses of saline solution in minute volume.

Total safety is the key to this device.

DR. KATZIN:

"It is a powerful instrument that is most powerful in the most difficult situations, and completely harmless in the situation of not injuring the tissues you want to save."

HERBERT M. KATZIN

NARRATOR:

After the lens is broken up, the single pulser tip is replaced with the irrigator-evacuator.

It injects a flow of saline solution, and at the same time evacuates lens material.

Should the surgeon require all three functions of pulsing, irrigating and evacuating at the same time, a threeway tip can be used.

Every task is performed under conditions of exact electronic control.

DR. KATZIN:

"Now all this is monitored through a transducer which is right on the board and which is connected directly to the inflow and outflow tubes. More than that, it is made of a unique plastic that can be autoclaved.

So you take the transducer of the board and take the tubes out of the transducer, autoclave them and you are ready for the next case, in a three-minute cycle, or whatever your autoclave handles."

NARRATOR:

The transducer guarantees constant safe balance of pressure within the eye.

It prevents the power of evacuation from building up to a point where sudden evacuation might induce collapse.

If anything occludes the tip, an indicator rises. At a set level, a warning signal sounds. The irrigation stops, the pump reverses into kick-back, to blow off the occlusion.

The tip is freed. The indicator drops. The pump resumes suction.

The hydro-pulse instrument combines many functions, under carefully programmed safety conditions.

It was designed by engineer Mark Wallach for Doctor Katzin, with the aim of giving surgeons exactly the tools they need for the problems they meet.

It can be used, without elaborate training or preparation, under normal conditions of surgery.

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The initial steps are exactly those taken in a conventional operation.

But as surgery proceeds, differences begin to emerge. For example, the incision is small-three millimeters through the limbus.

The small incision is part of a total hydro-pulse concept which works to keep the eye stable during surgery.

The capsule has been opened. It is time for the first phase of the hydro-pulse operation.

The pulser tip is mounted and tested. The pulse discharge volume is in the order of two one-thousandths of a cubic centimeter.

The surgeon tests it, to judge the most desirable volume, force and frequency for the case before him.

He calls for the combination he wants. Now he is ready to break up the lens. The patient is a 45-year-old man who developed a mature cataract quickly following the onset of diabetes.

A mild force and rhythm of pulsing is pre-set, since the lens is of a type that will yield easily to the minute saline pulse.

When the lens has been broken up, it is time to change tips.

Now the irrigator-evacuator is mounted on the same system.

The change takes only a few seconds. First, irrigation begins, to maintain the anterior chamber.

Then the surgeon calls for evacuation. He continually directs the balance of saline pressure within the eye.

Always, he works with the assurance that any occlusion will be detected by the system, and the suction pump automatically reversed in one one-hundredth of a second.

When the operation approaches the end stage, the levels of irrigation and evacuation are lowered.

The pupil is becoming black.

What is left is the job of tidying up. The hydro-pulse system has been preprogrammed to give the surgeon complete control of operating conditions. It frees any surgeon to concentrate on the pathology before him.

HERBERT M. KATZIN

DR. KATZIN:

"We have had the instrument now for about three years in operation at the hospital, and I would say that maybe one-third of the cases were done by untrained residents. I shouldn't say 'untrained', I should say that residents who have done routine surgery but who haven't used this machine at all. Say a surgeon has done ten to fifteen cataract operations in a routine manner and is accustomed to having the responsibility of the operating room and so on.

The safety features are built in nicely, so that we don't have to be concerned that he is going to do injury to anything. More than that, it does some of his thinking for him."

NARRATOR:

The hydro-pulse is a multi-purpose surgical system. In addition to the liquid scalpel and the irrigator-evacuator, it also includes a closed hydraulic power drive called a 'hydro-cut'. This unique accessory can be used to oscillate the Macheimer tip or other cutting devices.

The patient is an eleven-year-old boy who suffered an eye injury. This produced an extremely tough and thick fibrous secondary membrane.

At this point, the hydro-cutter is used to sever a central piece of membrane from the rest. It is difficult to reach by other means.

DR. KATZIN:

"Already in our hospital it has taken over the function, for example, of doing most secondary membranes: after a cataract operation, we simply make an opening in it, nibble it away with the Macheimer tip, and we end up with nice results. We've really hit some beauties."

NARRATOR:

Once the secondary membrane has been cut free, it can be removed. The edges are trimmed. The remaining cortex of the cataract, which was behind the membrane, is cleared.

The result, an acceptably-shaped, black pupil, with scar tissue serving as part of the iris diaphragm.

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DR. KATZIN:

"Most of these eyes don't look operated the day after they come from the operating room. Actually, with all the safety features built into the machine, we are in a position now really fully to explore all the parameters of the Liquid Scalpel."

SUMMARY

The author presents a new instrument of his design, whose working principle is the emission of saline pulsations, whose frequency, pressure, and volume/minute may be controlled. He describes the instrument as used in the technique of fragmentation and aspiration of hard nucleous lenses, recommending it for its absence of harmful effects to the eye.

The mentioned instrument is part of a "Hydraulic Pulsating System" (Multi-purpose), to which different heads may be coupled:

1. Liquid Scalpel.
2. Irrigator-evacuator.
3. Hydro-Cut.

The equipment may be sterilized completely and is easy to manage.

The author has been using it for 3 years.

C. B.