Instrument repair for remote eye units

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Many skilled eye surgeons in remote hospitals face the frustration that a simple instrument, once in good working order, is now bent or broken. Many eye units have a box containing instruments needing repair, hidden away in a stock room cupboard, in the hope that someone, someday, will be able to redeem them.

This article gives guidelines on:

1 How to assess instruments and identify those that can be repaired locally, those that should be sent to a professional repair service and those that cannot be repaired at all.

2 How to make adjustments and carry out basic maintenance and repairs of surgical instruments.

The article will refer primarily to instruments in an extracapsular cataract extraction set.

Figure 1. Basic repair set (right)

1. light brass hammer
2. bending tool
3. cotton wool
4. 600 grit diamond file
5. small Arkansas stone
6. assorted fine files
7. mild abrasive (tooth paste)

Assessment

Quality of the instrument
A good quality instrument is worth repairing. Many less expensive instruments have been poorly hardened and will wear quickly, bend or become dull. Considering the time and effort required, these might not be worth repairing.

Amount of damage
Cracks in the metal, flaking of metal fragments or sharp edges on 'blunt' instruments risk injury to the patient's eye during surgery. If these defects cannot be repaired adequately for patient safety, the instrument should be discarded. Cracks in the hinges of scissors, needle holders, forceps joints and haemostats will continue to cause problems with alignment and cannot be repaired. Sometimes such instruments can be used for spare parts.

Value of the instrument
If an instrument such as a capsulotomy scissors, one of the most expensive and most delicate of instruments, needs to be adjusted or sharpened, it is worth sending to a reputable repairer. These scissors are difficult to sharpen and the metal is extremely hard and brittle. Any attempt to bend the instrument can cause irreparable damage.

The following instruments can usually be repaired on site depending on the experience of the repair technician:

- A *dialler* or *muscle hook* is less expensive, it is made of softer metal and can be easily straightened
- A *Westcott's scissors* can usually be adjusted, tightened and sharpened but this needs some skilled attention
- Most micro forceps – *Colibri*, *Hoskins*, tying and toothed forceps – can be realigned. If the teeth are broken it can be repaired but it is difficult. It may be more feasible to remove the teeth and make a tying forceps out of the instrument instead
- With the correct tools, a groove can be re-cut in a *grooved forceps*.

Re-usable knives can be sharpened but it requires some skill to sharpen the point and keep the edge smooth. Preferably, this should be done by a professional repair service.

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Remember!

- Careful handling while inspecting, adjusting and repairing instruments will avoid injury and reduce damage to the instrument
- Always clean and sterilise surgical instruments before attempting to repair them or before sending to any repair service
- Repair technicians should wear safety goggles to prevent eye injury from minute fragments of metal.

Maintenance

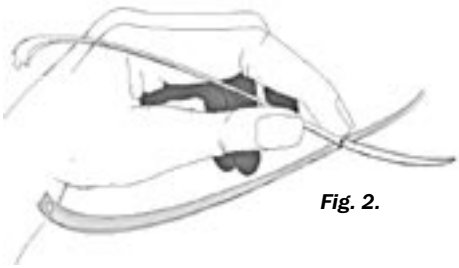

Fig. 2.

Inspection
First determine what the problem is. It is good practice to try to find only one cause to explain why the instrument is malfunctioning. The operating microscope, when not in use for surgery, can be used to inspect and adjust instruments.

Look for bent parts, loose or cracked hinges, scissors or haemostat jaws which do not meet properly or have excessive wear, broken teeth, grooves, rust pitting or shiny areas where there are rubbing points.

Listen for clicks in toothed forceps, scissors or hinges.

Feel for abrasion, roughness or friction.

Test for sharpness. Check surgical blades by piercing a piece of rubber glove stretched over a small container (e.g., a photographic film container). The blade should enter smoothly without a 'pop' or resistance.

Check scissors for sharpness with a few strands of cotton wool. The scissors should cut the strands cleanly without dragging.

While making repairs re-check the instrument periodically in the same manner.

Cleaning and lubricating the moving parts
Stainless steel instruments will also rust if left wet. This can be reduced by always using distilled or rain water in boilers and autoclaves. Instruments should be dried thoroughly before storing. An instrument may become rusty and the moving parts (e.g., the hinge) will stop working. Commercial rust removal and cleaning solutions are available but soaking in *Coca-Cola* for 30 minutes only is usually effective. Prolonged soaking will damage the instruments. Instruments should be rinsed in distilled water.

A scissors or needle holder with a corroded or stiff joint can be freed up by applying a mild abrasive compound (e.g., ordinary toothpaste), while moving the joint open and shut. Commercial grinding or rubbing compounds are available. A proper lubrication solution should be applied after thoroughly cleaning and drying the instrument.

A Simcoe irrigation/aspiration canula often gets blocked. The blockage is almost always at the tip where the small aspiration port opens. NEVER try to unblock the canula by heating it in a spirit lamp as this will melt the solder and cause a rough canula. Soak it in water first then use a small stainless steel wire alternately from each end of the canula to work the blockage free. This can be done under the microscope or slit lamp to increase visibility.

Adjustment and Repair
Alignment. Check teeth and jaws under the microscope. With a locally made bending tool, and a little practice, many instruments can be repaired easily (see Box 1, Figures 3 & 4). Find the point of greatest misalignment and straighten this first. When bending, choose a slot that fits the instrument well and over-correct slightly because the metal will spring back a little.

BOX 1
How to make your own bending tool

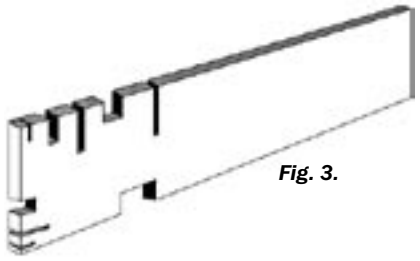

Fig. 3.

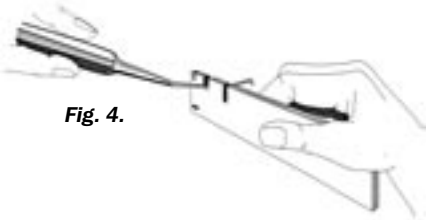

Fig. 4.

The suggested dimensions for a bending tool are one inch wide, five inches long and 1/8 to 1/4 inch thick. The bending tool should be made from brass or mild steel (Figure 3). The grooves on the tool can vary in width from the thinnest cut that you can make up to about 1/8 to 1/4 of an inch. Narrow slots are preferable. The slots can be cut with a hacksaw and smoothened or widened with a file (Figure 4).

Filing or grinding. Any filing or grinding to remove defects, reshape or restore an instrument should be done only as a last resort. It is important to maintain the original crafted design and shape of the instrument. Filing or grinding removes a lot of metal quickly and can permanently destroy it. Concentrate on removing metal from the flatter surfaces first, and then only small amounts from edges and corners.

Sharpening. Scissors and reusable knives require skilled attention. Practice first on old instruments as good instruments can easily be ruined in the hands of a novice.

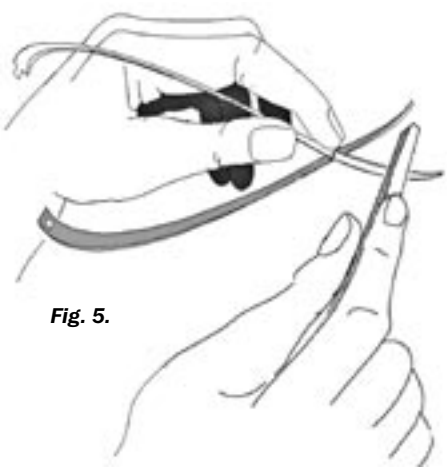

Fig. 5.

1 Hold the instrument firmly against a block or table edge
2 Always maintain the same sharpening angle with which the instrument was manufactured
3 Use a smooth, even movement at the same angle with every stroke of the stone (smooth Arkansas stone 800 – 1200 grit). A more expensive 600 grit diamond file is useful for coarse sharpening and shaping
4 Always sharpen in one direction into the cutting edge (Figure 5)
5 Hold the blade so that light reflects off the surface being cut and you can see that you are maintaining the same angle on every stroke
6 Never sharpen along the inside hollow surface of the blade as this has been hollow machine-ground by the manufacturer.

Note: If you do not have an Arkansas stone, a piece of 1,000 grit wet emery paper can be glued onto a small piece of wood (e.g. a tongue blade) and used instead.

Tightening. The hinge on a scissors, needle holder or haemostat may become loose. A good instrument probably has a screw in the hinge but many have a rivet.

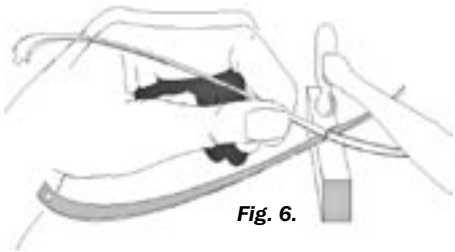

Fig. 6.

1 If the screw can be tightened, do this first. Often half of the head of the screw will break off. Then gently knock over the edges of the end of the screw to stop it loosening again.
2 If there is a rivet or a screw that will not loosen, tighten the joint by placing the joint flat on a metal surface and gently tapping with a very small hammer (Figure 6).

Finish. A smooth shiny finish (surface) resists rust. A smooth dull finish causes less distracting light reflection for the surgeon while operating.

Repair the finish by first using coarser abrasives and then finer and finer abrasives, ending with a polishing compound.

Final sharpening of scissors should be done after polishing is completed. Make sure instruments are thoroughly washed and cleared of all grit before being used again.

Wet emery paper in grit sizes 200, 400, 600, 1,000 is recommended. Always use these with water, a little liquid soap may be added. Many excellent abrasive alternatives are now available from jewellers' supply companies but these are expensive.

For useful resources, please see back page.