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10

Disposable vs Reusable Surgical Instruments: How to Decide?

Which instruments should you choose based on cost and procedure?

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Advances in vitreoretinal surgery and, specifically, the advent of minimally invasive surgery (23-gauge and 25-gauge) have led to increased efficiency. Consequently, there is a greater trend toward the performance of retinal surgery in ambulatory surgery centers. Whether operating in a hospital or an ambulatory surgery center, improved patient outcomes and efficiency remain important to every vitreoretinal surgeon. In the era of 20-gauge vitrectomy surgery, reusable vitreoretinal instrumentation was standard and the repair and maintenance of the larger instrumentation was determined to be cost-efficient. The development of reliable disposal instruments have led us to re-evaluate our usage of reusable instruments in small-gauge vitrectomy surgery. We review many factors in considering the decision to use disposable vitreoretinal instruments vs reusable instruments.

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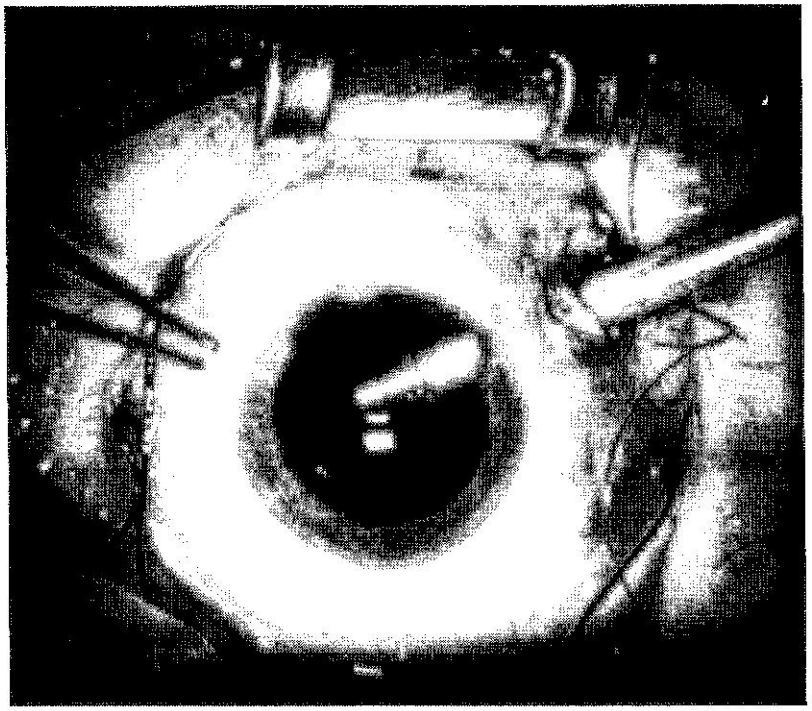
RELIABILITY AND QUALITY

Almost a decade ago, when 25-g vitreoretinal surgery was not commonplace, the first generation of disposable microinstruments were introduced to the market. The high degree of flexibility combined with variable quality and consistent instrument actions limited the use of these first-generation 25-g instruments. Overall, the disposable 25-g instruments were not as reliable as the reusable 20-g instruments, and the limited options for instrumentation limited the cases that could be performed with 25-g surgery. The basic vitrectomy instruments also suffered from problems with flexibility of the vitrectors and inconsistent trocar assemblies.



When it was first introduced, vitrectomy was performed with 19-gauge instrumentation.

Now in 2010, vitrectomy itself has been revolutionized, with most vitreoretinal surgeons adopting and offering 23-g and/or 25-g surgery. The issues of flexibility and reliability have been solved with the majority of the newer microsurgical instruments, and the quality control is excellent. By changing shaft design and incorporating titanium, the small-gauge instruments are much less flexible and allow most surgeons to become comfortable performing smaller-gauge surgery. The newer generation of disposable 23-g/25-g instruments is consistently reliable.

Although the microsurgical instruments differ from one company to another, the quality as a whole is superior. A surgeon can feel assured that when a forceps or scissors is opened on the sterile field, these grasping implements will perform perfectly each time. This "peace of mind" is very important for the surgeon. Delays attributable to instrument failure can include: replacement of the faulty instrument, adjustment of the faulty instrument, or worse, poor grasping/cutting of intraocular tissue. If intraocular delays occur due to instrument failure, the extended time, or even unintended tissue response during peeling or cutting, could ultimately affect patient outcomes. For instance, gradual degradation of scissor blades can affect the precision of dissection during complex diabetic vitrectomies.

FRAGILITY

During the era dominated by 20-g surgery, reusable instruments — although considered small and fragile by most surgical technicians — were the mainstay of vitreoretinal surgery. Reusable instruments were expected to degrade over time and would require servicing and ultimately replacement. The longevity of these instruments depended on the overall amount of wear and tear and, of course, the care given by the experienced ophthalmic surgical technician. With the gradual movement of vitreoretinal surgery to smaller gauge, the reusable microsurgical instruments (23-g/25-g) became more difficult to maintain and harder to wash and handle. Even in the hands of an experienced ophthalmic surgical technician, damage to the instruments occurs. The smallest alteration in the grasping platform or scissor blades can affect function and slow down operative time. Ophthalmic surgical staff is trained to care for instrumentation; however, more extensive training is needed to teach and train staff for washing, care, and use of these fragile, small-gauge instruments. The upkeep of these smaller instruments is difficult and, therefore, more frequent servicing and replacement are expected.

Disposable small-gauge instruments negate this factor of fragility. The ophthalmic technician can easily be taught to protect the instrument at all times during the surgical case. Handling of the instrument, with special attention to not have the tips interact with any other metal instrument, is imperative. The instrument can be

handed to the surgeon carefully, and once the case is done, the instrument can be discarded. Once the case is completed, a new instrument is then opened for the next case, which diminishes instrument cleaning time, thus improving the efficiency of the staff to process and the operating suite.

STERILITY

A safety concern with any reusable instrument is true sterility and possible cross-contamination. In vitreoretinal surgery, we are manipulating neural tissue, and the unknown possibility of prion contamination of instruments cannot be totally discounted. When using reusable instruments that are resterilized for each subsequent case, the issue of true sterility could be in question. Small fragments of tissue left from previous cases can be difficult to identify by the technician and even more difficult to free from the grasping platform or cutting blades. Cleaning of these reusable instruments is time-consuming, difficult and ultimately delays operative turnover time. With disposable instruments, the surgeon can feel assured that the instrument is sterile and not have to worry about any possible cross-contamination. The manufacturer of these smaller-gauge instruments will inspect, package, and then sterilize the instrument to be opened on the sterile field just prior to use, thus insuring peace of mind.

COST-BENEFIT ANALYSIS

In performing a cost-benefit analysis of the use of disposable vs reusable instruments for 23-g/25-g vitreoretinal surgery, there are both tangible and intangible costs to consider. The tangible cost of reusable instruments includes the price of the instruments, as well as the cost to repair and maintain them. For example, in our past experience, the average instrument can cost $3,000. For each instrument, two are needed (one for backup), making the cost per instrument type $6,000. Depending on the number of cases performed and wear and tear, we could expect to send out an instrument for repair three or four times a year before needing to replace it. Each repair costs on average between $800 and $1,000. We would usually replace instruments once per year, always trying to keep one working instrument available at all times. The annual budget for reusable instruments was anywhere from $10,800 to $17,000 per instrument type, depending on the repair and replacement needs.

Intraoperative surgical photograph of a diabetic tractional retinal detachment treated with 23-g instrumentation.

The intangible costs of using reusable instruments are more difficult to quantify. An instrument that malfunctions during a case can cause undue stress on the operating room staff and surgeon, especially if it occurs intraocularly.

Moreover, each vitrectomy to follow will be dependent on a backup instrument, which may or may not be in top working condition itself. After the operating day is over, the operating room staff has the added work of filling out paperwork and arranging for timely repair of the primary instrument.

Time is another intangible factor that is difficult, although not impossible, to quantify. As mentioned earlier in this article, time required to properly clean and sterilize microsurgical instruments is prolonged with the use of reusable instruments. Time during which a case is stalled while an instrument is replaced can also add up, which can be especially important in an ASC setting. The time spent on delays can be equivalent to an additional case so that significant revenue may be lost because of these delays. When all of the costs are weighed between using reusable vs disposable instruments for 23-g/25-g surgery, we feel that using disposable instruments is cost-effective and beneficial for our patients, surgeons and operating facility.

WIDE INVENTORY OF OPTIONS

In the era of reusable instruments, the cost of each individual instrument prohibited our ability to have a broad variety of instrument types. Often, surgeons would choose their optimal instrument and purchase two to have on hand for surgery and backup. Due to the initial cost of each instrument, having multiple instrument types that were used less frequently (for example curved scissors, vertical scissors, foreign-body forceps or magnets) was more problematic. When needed, these instruments were often in disrepair, oxidized, or possibly even rusted, depending on the length of time since their last use.

A wide assortment of disposable instruments exist now in 20-g, 23-g and 25-g options. Multiple companies offer excellent disposable products. Handle design and feel differ from one company to another, as do the various tip designs themselves. Some companies even have color-coded instruments for easier identification between different gauges.

The flexibility of the instruments varies, as does the case of fit through the trocars themselves. Since each surgeon varies in surgical techniques and approach to retinal surgery, we suggest that retina surgeons contact each company directly to obtain samples of disposable instruments to evaluate their options. Some companies that currently offer disposable instruments include: Dutch Ophthalmic USA (www.dorc.nl), Alcon/Greishaber (www.alcon.com), Synergetics (www.synergeticsusa.com) and Bausch+Lomb/Storz Ophthalmics (www.storzeye.com).

There is a wide selection of disposable products available for vitreoretinal surgery in multiple gauges. These include: forceps with various tip designs (including foreign body forceps), scissors with various tip designs, foreign body magnets, diamond-dusted sweepers, backflush instruments, retinal pics, spatulas, soft-tip cannulas, micro-vitreoretinal blades, vitrectomy contact lenses, light fibers and laser probes. Some manufacturers also offer their forceps and scissors as attachable tips that can be paired with several different reusable handles to fit the preference of the surgeon. Since most disposable items are sold in packages of four or six, the surgeon has the flexibility of changing his or her choice of forceps or scissors from one manufacturer or style to another.

OTHER INSTRUMENTATION: CHANDELIER LIGHT SOURCES AND LASER PROBES

Wide-field illumination sources permit bimanual manipulation to address complex pathology in addition to improving efficiency for 23-g/25-g surgeries. The extra light source can permit good visualization throughout the posterior segment for both posterior and anterior membrane delamination with two active instruments.

Typically, microforceps are used for countertraction in combination with a cutting instrument for thick, tenacious membranes or membranes overlying mobile detached retinal tissue. A sharp pic or scissors can be used for the second instrument; however, the newest generation vitrectomy probes can be used to precisely and effectively delaminate complex membranes. The extra light source can also be used to facilitate surgery in a variety of scenarios, such as scleral indentation in combination with endolaser or concomitant drainage

and laser of a retinotomy site. There are many possible light sources that include Alcon's xenon light source, as well as the Photon I and II from Synergetics. In addition, the xenon light source in the Alcon Constellation vitrectomy system can effectively illuminate many different chandelier probes, including the Tornambe Torpedo, Neptune, and Photon probes.

Multiple manufactures have developed laser probes for small-incision vitrectomy surgery. Straight laser probes can be used easily for areas posterior to the equator; however, anterior laser often requires the indirect headpiece. Curved laser probes can reach the anterior retina, but insertion through a 25-g trocar can be challenging. Directional laser probes offer facile placement through both 23-g and 25-g trocars and can deliver laser effectively to the anterior and posterior retina; however, they are more costly than nondirectional probes. Alternatively, the Photon system may accommodate lighted laser probes that allow unimanual delivery of laser to the anterior retina in association with scleral indentation.

CONCLUSION

The decision between using reusable and disposable vitreo-retinal instruments requires weighing many different factors, including reliability, fragility and sterility. In the era of small-gauge minimally invasive surgery, reusable instruments are difficult to care for and are more prone to damage. A careful cost-benefit analysis, we believe, will show that disposable instruments are most cost-efficient when considering both the tangible and intangible costs in this era of 23-g/25-g surgery. Also, with the wide assortment of disposable options available, the use of these products makes sense, particularly when considering less frequently used instruments. Finally, there are several companies that offer a great assortment of disposable instruments and products for vitreoretinal surgery. Since each surgeon has specific needs and surgical styles, we recommend that he or she contact each company for more detailed information. **RP**

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Table of Contents
Archives