ORIGINAL ARTICLE

Are Your Liposuction Cannulas and Handle-Cannulas a Potential Problem If Used for Autologous Fat Graft/Transfer?

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Objectives: *To create surgeon awareness that some liposuction instruments should not be used for harvest and reinjection during autologous fat grafting (AFG), to outline which instruments need special cleaning techniques, and to increase awareness of available customized devices that will eliminate the accumulation of debris in defect areas.*

Methods: *The author examined 13 common liposuction handles and 22 liposuction cannulas noting their construction and ease of cleaning by brush and pressured water. Internal examination of the handles was done by cutting them in half longitudinally observing the pathway of the fat during harvest. The cannulas were examined by probing the tips of the cannulas to determine if blind pockets were present.*

Results: *A few of the instruments had an acceptable continuous pathway and no problem cleaning areas. However, 10 of the 13 liposuction handles had severe drop-offs and cracks that would be very difficult to clean, and 18 out of the 22 cannulas contained a blind pocket in their distal tip. The most common structural problem for the handles was the severe drop-off but the most serious problem for the handles was the crack. The most common and serious problem for the cannulas was the tip blind pocket. These areas would require special cleaning efforts to qualify for use during AFG/T.*

Discussion: *When AFG became a more popular procedure, surgeons adapted by using liposuction instruments for harvest and reinjection. However, because fat transfer involves reinjecting fat back into the body, the instruments must be easy to clean. Most liposuction instruments are built to transport liposuction waste fat only; thus, they have a crude interior design with drop-offs and pockets that make them difficult to clean. Some of these devices can harbor pockets of old tissue. In general, if the pathway is continuous and is not interrupted by drop-offs or blind pockets, the instrument can be used for both liposuction and AFG. If, however, there are drop-offs and/or blind pockets, the surgeon should make certain the unit is dismantled and every area cleaned manually between procedures or should turn to the many customized instruments for AFG.*

Conclusions: *The decision to purchase and use liposuction instruments for AFG should be made only after the surgeon has examined the product and is confident that the pathway has no drop-offs and/or blind pockets that make it difficult to clean. Custom AFG instruments are available that are constructed in a manner that negates the need for special cleaning procedures.*

Initially, autologous fat grafting (AFG) was known as autologous fat transfer, but because the transfer ultimately becomes a fat graft, the AFG terminology has become standard. The transition from standard liposuction, in which the waste fat is discarded, to AFG occurred gradually, and early concerns were centered on such aspects of the procedure as cannula diameter, lengths, hole pattern, hole number and size, vacuum power, filtering device, reservoir, and tubing. With the focus on external parameters, no one examined the internal pathway of the harvest as it passes through the handle and the cannula. For some instruments, the findings were alarming.

The author became interested in the internal pathway of cannulas and handles while designing an improved custom handle-cannula for AFG. At that time it became evident that the lipocyte pathway would have to be easy to clean or contamination from procedure to procedure could be a problem. Upon examination of the products on the market, the author

Received for publication May 15, 2009.
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discovered several that were being used interchangeably for liposuction and AFG that probably should not be used for AFG. This article describes those handles and cannulas.

A search of the literature revealed little about the use of liposuction handles and cannulas for AFG other than the assumption that physicians use liposuction instruments interchangeably for AFG.[1-11] However, now that the difference in the procedures is recognized, further investigation is warranted.

Purpose

The purpose of this article is (1) to create surgeon awareness that most liposuction handles and cannulas should not be used for harvest and reinjection during AFG/T without special cleaning efforts because they have defects that make routine cleaning difficult to impossible, (2) to outline which instruments need special cleaning techniques, and (3) to increase the awareness of new AFG/T customized devices that will eliminate this problem. This article is being presented because some of the liposuction instruments now in use could affect the sterility and/or the foreign antigen content of the harvested tissue. By identifying which instruments are potentially problematic (ie, those with built-in pockets and drop-offs that cannot be cleaned easily) and comparing them to cannulas that have a continuous pathway with no pockets or drop-offs, this article should help surgeons make better choices regarding cannulas and handle-cannulas for AFG. Today, improved instruments are available that can be cleaned very easily without dismantling.

Methods

The author examined 22 cannulas and 13 handles including handle cannulas currently used for liposuction (Figures 1 through 8; Tables 1 and 2). Although the cannulas were designed for liposuction, they are often used interchangeably for liposuction and AFG. To determine the pathway inside each handle, the handle was split longitudinally with a metal saw to expose the pathway of the harvested tissue. Each half was examined, and the physical pathway of fat through the handle and cannula was noted. Drop-offs or pockets that could not be reached easily with the standard brushes and pressured water currents normally used for cleaning cannulas were noted. For the purposes of this study, a drop-off was defined as a sudden change of direction in the tissue channel, and a blind pocket was defined as a change in the tissue channel ending in a pocket that is very difficult to clean.

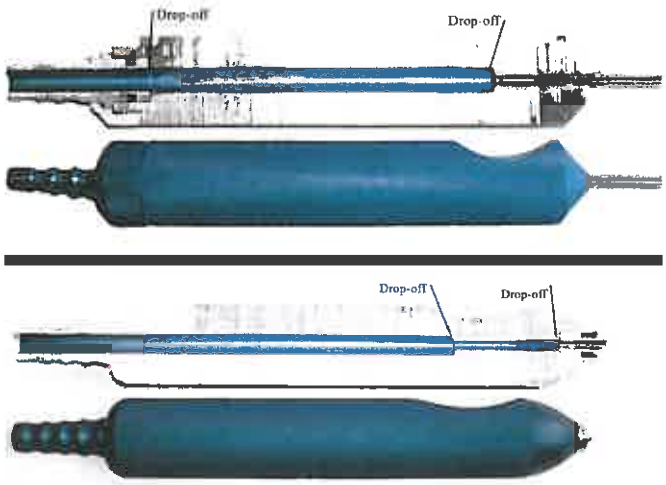

Figure 1. *(Top) Blue aluminum one-piece handle-cannula, manufactured and/or distributed by Kolster Methods Inc, Wells Johnson, HK Medical, Mentor-Byron, and others. The model has two drop-offs that require two different brushes, and dismantling is crucial for cleaning. It is suitable for liposuction, but special cleaning steps are needed if used for autologous fat grafting (AFG). (Bottom) Blue aluminum two-piece handle with Luer coupler, manufactured and distributed by Kolster Methods Inc, Wells Johnson, HK Medical, Mentor-Byron, and others. The model is designed for liposuction. It has two drop-offs that require two different-sized brushes to clean. It is suitable for liposuction, but special cleaning is needed if used for AFG.*

Pockets were probed with an angled probe, and the depth was recorded. Pockets less than 1.0 mm were considered cleanable by the usual brush and pressured water technique, but pockets 1.0 to 8.0 mm were considered problematic. Some of the pockets and drop-offs were so deep in the handle that they could not be reached. Deeper pockets and drop-offs deep within the handle are more vulnerable to the accumulation of tissue and impacted debris. Abnormalities in the form of drop-offs and pockets were measured and recorded (Figures 1 through 8; Tables 1 and 2).

Results

For the purposes of this study, "unacceptable" means the product is not acceptable unless the physician institutes special cleaning procedures that counter the residual tissue problem.

Cannulas

Eighteen of the 22 liposuction cannulas had blind pockets that would require special cleaning procedures to make them acceptable for AFG/T. Blind pockets cannot be cleaned easily with the routine brush and pressured water and these areas could harbor debris

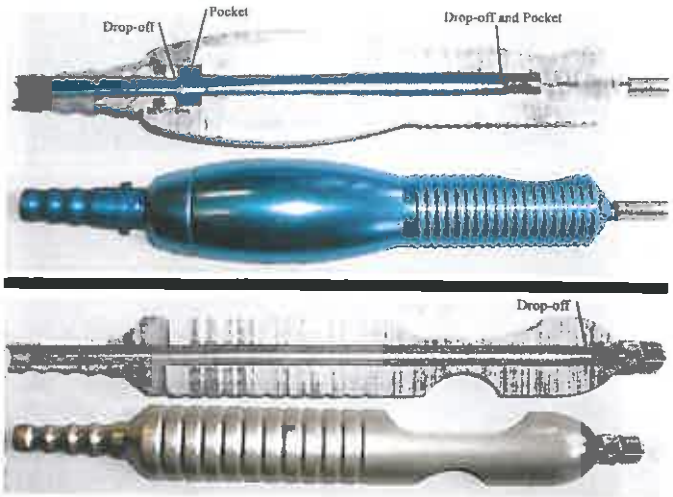

Figure 2. *(Top) Blue aluminum one-piece handle-cannula with palm bulb fit, manufactured and distributed by Kolster Methods Inc. The model is designed for liposuction and has two drop-offs and two blind pockets. It is suitable for liposuction, but special cleaning is necessary if used for autologous fat grafting (AFG) or autologous fat transfer (AFT). (Bottom) Gold two-piece aluminum handle with Luer tip, manufactured by Wells Johnson and distributed by Wells Johnson and Shippert Medical. The model is designed for liposuction and has one drop-off. It is suitable for liposuction, but special cleaning steps are needed if used for AFG or AFT.*

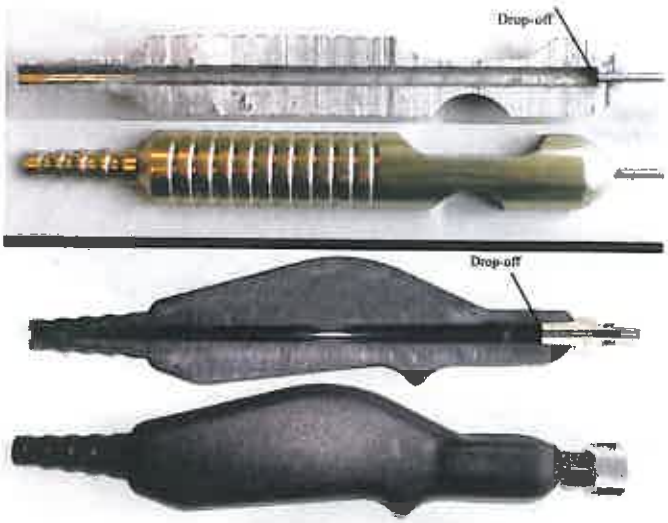

Figure 3. *(Top) Gold one-piece aluminum handle-cannula, manufactured by Wells Johnson and distributed by Wells Johnson and Shippert Medical. The model is designed for liposuction and has one drop-off. It is suitable for liposuction, but special cleaning steps are needed if used for autologous fat grafting (AFG). (Bottom) Biplane two-piece ergonomic handle with Luer couple and old-style polymer tissue pathway, manufactured by Shippert Medical Technologies and distributed by Shippert Medical Technologies and Wells Johnson. The model has one drop-off. It is suitable for liposuction, but special cleaning steps are needed if used for AFG.*

from the previous procedures. When the blind pocket is in the tip of the cannula, cleaning with a brush from the opposing end can actually cause further impaction of the material in the tip pocket. In the author's opinion, any cannula with a blind pouch at the tip should undergo special cleaning techniques before it is used again, even if used for liposuction (Table 2; Figures 6 and 8, lower photo). Acceptable cannulas are shown in Table 1 and Figures 4, 7, and 8 (top photo).

Handles

Ten of the 13 handles examined had irregular drop-offs and cracks. The cracks in the handles are considered blind pockets, and these irregularities cannot be reached by standard brushing or pressured water currents. Crack-type pockets are impossible to clean. When these handles are used in liposuction, the harvest material has already passed out of the body and is destined for the waste canister. Although these handles are not perfect, because the location of the deformity is inside the handle, they are considered acceptable for liposuction but definitely not for AFG (Table 2; Figures 1, 2, and 3).

Continuous Pathway Handles

Three of the 13 handles examined had a continuous uninterrupted pathway with no drop-offs, cracks, or pockets. These handles have a common construction feature: one uniform-sized continuous channel that does not allow tissue to accumulate. Thus, these handles can be used interchangeably for liposuction and AFG, because they can be prepared for autoclaving with one brush and a stream of pressured water (Table 1; Figures 4 and 5).

Disposable Cannulas and Handle-Cannulas

Disposable cannulas and disposable handle-cannulas may have inner deformities in the pathway of the harvest, but because they are discarded after each procedure the finding is not important. Thus, whether used for liposuction or AFG, the inner construction of disposable cannulas is not important.

Acceptable and Unacceptable Devices

The AFG-acceptable devices that have no drop-offs or blind pockets are summarized in Table 1. Devices with drop-offs or blind pockets, which make them AFG unacceptable, are summarized in Table 2.

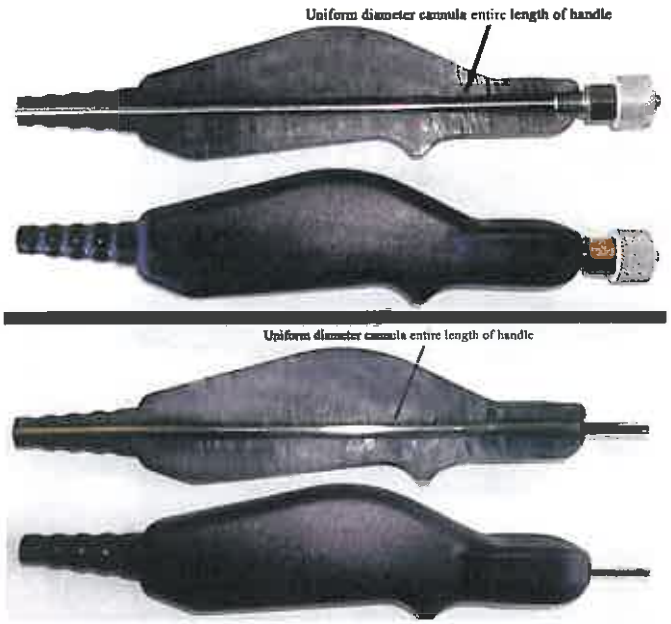

Figure 4. *(Top) Biplane two-piece ergonomic handle, manufactured by Shippert Medical Technologies and distributed by Shippert Medical Technologies and Wells Johnson. Special construction allows the cannula to run the entire length of the handle; thus, it is very easy to clean with one brush and pressured water. There are no drop-offs and no blind pockets. The model is suitable for liposuction and for autologous fat grafting (AFG). (Bottom) Biplane one-piece ergonomic handle-cannula constructed with the cannula running the entire length of the Handle with no handle drop-offs and or blind pockets. The model is manufactured by Shippert Medical Technologies and distributed by Shippert Medical Technologies and Wells Johnson. It is simple to clean and thus suitable for liposuction and AFG.*

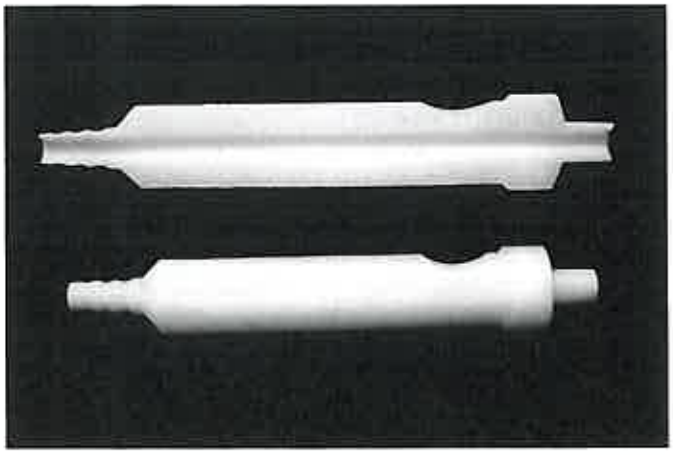

Figure 5. *The Toomey Delrin handle, which is manufactured by most cannula companies. It has a continuous channel and no drop-offs. It is simple to clean and thus suitable for liposuction and autologous fat grafting or autologous fat transfer.*

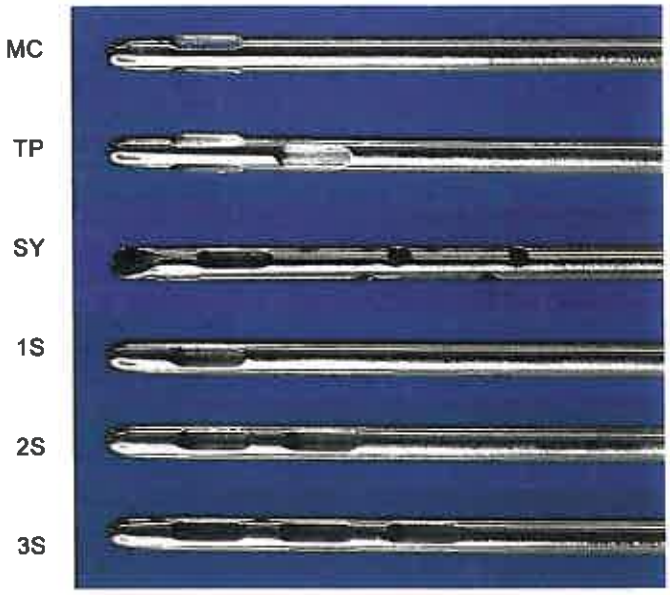

Figure 6. *The Mercedes, triport, Saylan, and standards models, manufactured by most liposuction product companies. These patterns all usually have a blind pocket in the tip. Tissue can become imbedded in this area, and they can be very difficult to clean. Special cleaning techniques should be used of all of these hole patterns.*

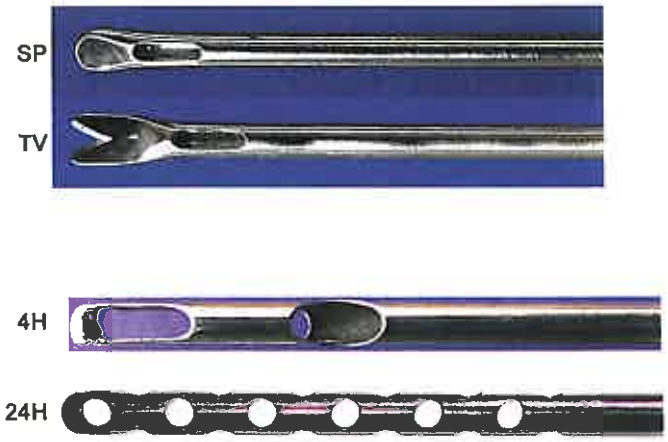

Figure 7. *(Top) The spatulas and Toledo V models are manufactured and distributed by most liposuction companies. Some of these cannulas have a blind pocket and some have a solid tip. Solid tips can be used for autologous fat grafting (AFG) or liposuction, but the blind pocket tips need special cleaning. (Bottom) TissuTrans harvest 4 oval hole pattern and 24 round hole pattern. Both of these harvest cannulas are manufactured and distributed by Shippert Medical Technologies. They are easily cleaned because they have no blind tip pockets and can be used for AFG or autologous fat transfer or for liposuction interchangeably.*

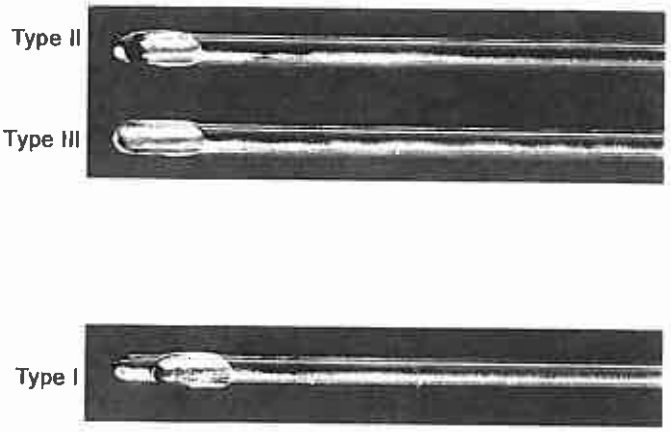

Figure 8. *(Top) Standard one hole (Coleman Type II and III) manufactured by most vendors. These have a very shallow pocket that is relatively easy to clean. There are no pockets in the tip and thus are suitable for autologous fat grafting (AFG) and liposuction interchangeably. (Bottom) Standard one hole (Coleman Type I) manufactured by most vendors. These cannulas have a blind pocket that is not easy to clean; thus, it will need special cleaning to be used for liposuction or AFG.*

Discussion

When the author indicates that an instrument is not recommended for AFG he does not mean that in an absolute sense. The acceptability decision should be made by an informed physician relative to the quality of the personnel and equipment available to clean the instruments. Obviously, if a surgeon has quality personnel who understand the problem and will follow instructions correctly all of the time, some of the instruments can be converted from unacceptable to acceptable. However, in all of these situations, the surgeon must be adamant that the device should be completely dismantled and cleaned using ultrasound cleaners when appropriate, various appropriate sized brushes, and a positive pressure water jet to produce a clean instrument, ready for the autoclave.

The need for special cleaning, of course, means more labor and higher resultant costs for that labor. It is always best to own instruments that are easy to clean and require very little maintenance as this decreases costs and liability. The expense and additional liability can be minimized, however, if the information in this article is used to choose AFG instruments that can be easily cleaned.

A Break in the Cleaning Protocol

The surgeon's personnel may be the cause of an instrument not being cleaned properly in several situations, the most common of which is a break in the cleaning protocol. The surgeon should rightfully expect that any cannula or handle-cannula that will be used on multiple patients has been adequately cleaned and sterilized between uses. The nurses and assistants doing the cleaning are usually following the surgeon's recommended technique, which typically includes internal brushing, followed by low or high pressure irrigation and then a sterilization procedure of some type. Ultrasound cleaning is always an additional option.

Table 1. Devices That Are Easy to Clean

Liposuction Device	Type	Companies*	Comments
Harvest cannula hole patterns (Figure 7, top photo)	Spatula, V tip Toledo.	WJ, KMI, SMT, HK, MB	Must probe the tip to see if blind pockets are present. Many of these have no pocket and thus are easy to clean.
Custom AFG harvest cannulas (Figure 7, bottom photo)	TissuTrans 2, 3, and 4 hole, Fastrack 12, 16, and 24 hole	SMT	These are manufactured especially for fat transfer and thus have no tip pockets.
Reinjection cannula hole patterns (Figure 8, top photo), Coleman type 2 and 3	Type 2 and 3	WJ, KMI, SMT, HK, MB	Holes are near the tip and the blind pocket is about 1 mm or less, which can be easily cleaned.
Radel polymer handles (Figure 4)	Biplane ergonomic with the cannula running the entire length of handle.	WJ, SMT	Cannula runs the entire length of the handle, producing no drop-offs or pockets. It is easy to clean with standard brushes and pressured water.
Toomey handles (Figure 5)	White Delrin	WJ, KMI, SMT, HK, MB	Easy to clean because of the size of the orifice and the straight channel through the handle.

*HK indicates HK Medical; KMI, Kolster Methods Inc; MB, Mentor-Byron; SMT, Shippert Medical Technologies; WJ, Wells Johnson.

Table 2. Devices That Are Difficult to Clean

Liposuction Device	Type	Company*	Comments
Harvest cannula hole patterns (Figure 6)	Mercedes, Triport standards, and Saylan	WJ, KMI, SMT, HK, MB	These hole patterns have a blind pocket at the distal tip.
Reinjection cannula hole patterns (Figure 8, bottom photo), Coleman type 3	Type 3	WJ, KMI, SMT, HK, MB	Holes are not near the tip, and the pocket is difficult to clean.
Blue and gold colored aluminum handles (Figures 1 through 3)	One-piece and two-piece handle-cannulas	WJ, KMI, SMT HK, MB, CSS	Contains drop-offs and blind pockets.
Blue-grey Radel handle (Figure 3, bottom photo)	Older model of the two-piece Luer biplane	WJ, SMT	There is a drop-off near the internal Luer segment.

*HK indicates HK Medical; KMI, Kolster Methods Inc; MB, Mentor-Byron; SMT, Shippert Medical Technologies; WJ, Wells Johnson.

The final sterilization procedure is usually performed by autoclaving, which subjects the device to 15 minutes of steam heat at 270°F and 15 lb of pressure. This sequence is ideal; however, in reality, many times one or more of the standard cleaning steps are not performed for a variety of reasons, usually intentional. During the cleaning process the helper may have an emergency that needs to be attended to, or a patient, surgeon, or other nurses may communicate with the helper during the protocol, and these interruptions could lead to the omission of one of the scheduled steps. The result is a break in the cleaning continuity and the instrument could remain potentially contaminated.

Instrument Construction Factors

Even with an ideal program, high-quality assistants, and no interruptions, the results can be less than ideal because of the manner in which some instruments are constructed. In such a case, an efficient cleaning cannot be performed because the construction does not allow for effective cleaning. Most of the time, even if the cleaning steps are not performed in a perfect manner, the sterilization process will produce a sterile instrument. However, the potential for a septic or allergic result in even a small number of patients is not acceptable because better equipment is available that will eliminate the problem.

Cannulas With Blind Pockets

For cannulas, blind pockets are usually located in the distal tip and are up to 8 mm deep. This extreme depth makes the pocket very difficult to clean efficiently, and a brush can actually impact the tissue even more. Most of these pockets escape adequate cleaning (Figures 6 and 8, bottom photo).

Cannulas With No Pockets or Irregular Pathways

Cannulas that are easy to clean have one common denominator: no blind pockets in the tip. These no-pocket cannulas have either a band-like tip that changes abruptly into a hole pattern on both sides or a longer solid tip that changes into a hole pattern on both sides. This construction eliminates all of the blind pockets in the tips. See Figures 7 and 8, top photo. These cannulas can be easily cleaned with brush and pressured water and can be used interchangeably between liposuction and AFG/T.

Luer Handles and One-Piece Handle-Cannulas With Irregular Pathways and Pockets

In some models, for example, the Luer handles and one-piece handle-cannulas (note: a one-piece handle-cannula has a built-in cannula that is not separable from the handle, whereas the two piece handle cannula has a cannula that is separable from the handle with a coupler such as a Luer.), a channel passes through the handle that is extremely irregular and has drop-offs and blind pockets. Some drop-offs are located proximally and some are located distally, which leaves several problematic areas to clean. This creates a channel that is not only difficult but sometimes impossible to clean. Examples of this are the blue aluminum handle, the most common handle used for liposuction, the champagne aluminum handle, and the first biplane Luer Radel handle, all of which were designed for liposuction, not AFG (Figures 1 through 3).

Handles With No Pockets or Drop-offs

Handles that are easy to clean have a common denominator: no blind pockets and no drop-offs in the pathway of the harvested tissue (Table 1). These products have a cannula that passes through the entire length of the handle (Figure 4), or the channels are molded uniformly without flaws (Figure 5). The importance of a continuous channel means it will have no drop-offs or blind pockets anywhere in the handle or cannula. Although a surgeon must still have confidence in the person performing the cleaning, proper construction provides more of a chance for proper cleaning. Handles that are acceptable for AFG are those that have a straight inner channel and thus no blind pockets, cracks, or drop-offs (Figures 4 and 5).

Disposable Cannulas and Disposable Handle-Cannulas

Construction problems such as drop-offs and blind pockets are a concern for durable reusable instruments only; if the instrument is disposed of after each procedure there is no need to clean them for the next patient. Thus, it is obvious that disposable instruments have an advantage over the durables. So, why not switch to disposables? The main reason is cost, although costs are gradually decreasing, and acceptance is gradually increasing. Acceptance is growing because practitioners are beginning to recognize that the high costs of labor to store, clean, and sterilize equipment are beginning to exceed the cost of the disposables.

Conclusions

When using liposuction instruments for AFG, some instruments can be used interchangeably, but they should not be used without special cleaning techniques. In choosing the appropriate instruments for AFG, surgeons should examine the entire pathway inside the instruments by using probes to determine the existence of pockets in cannula tips. They should also dismantle handles to make sure the drop-offs are cleanable. Some companies make drawings of the instruments available to aid in decision making.

Note that by saying a given instrument is unacceptable for AFG, the author does not mean it is unacceptable under all circumstances. It only means the instrument is unacceptable if the surgeon does not institute special cleaning techniques that will render it acceptable.

When liposuction instruments have too many internal pathway flaws for adequate cleaning, or if the surgeon does not have the personnel to pay special attention to cleaning the instruments, the surgeon should switch to the instruments that are customized for AFG. These customized instruments should only need cleaning via simple brushing and water jets (sometimes dismantling) before autoclaving.

The author's preference is that AFG be performed only with instruments that are designed for AFG and thus have no faults that need special cleaning. Such a perfect setting may not be available for some surgeons, in which case special cleaning techniques should be performed. Specifically, the instrument should be prepared for the autoclave by dismantling the handles, probing the cannula tips, and using several brush sizes and water jets to clean the instrument.

Acknowledgments

The author potentially has a conflict of interest because he uses his experience and knowledge to write about products that include some he has personally developed. However, Dr. Shippert is a physician first, and he realizes that practitioners must have accurate scientific facts about products to make good decisions. He compares these products in a manner that will help physicians. To accomplish this he names specific products by their trade name, identifies the company that manufactures the products, and compares the products by the same set of parameters. No preference is given to any product, but some products will be classified as superior relative to the parameters by which all are tested and evaluated.

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