

Safety of Wireless Ultrasound-Guided Gluteal Fat Grafting

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The American Journal of
Cosmetic Surgery
1–3

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DOI: 10.1177/0748806820938566

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Abstract

Gluteal fat grafting (or autologous fat transfer to the buttocks) is one of the fastest growing procedures in plastic surgery. However, as the popularity of the procedure has grown, so has the number of fatalities and complications. Fatalities are mainly linked to fat embolism, which can occur when fat is injected into the gluteal muscles, instead of subcutaneously. The use of wireless ultrasound imaging during the procedure can help reduce the chances of intramuscular fat injection and improve patient safety. Here, we present a 36-year-old female underwent circumferential liposuction with autologous fat transfer to the bilateral buttocks. From liposuction, 3500 mL of fat was harvested and 1000 mL of fat was injected into each buttock with wireless ultrasound guidance. We identified the subcutaneous plane where fat was to be injected, avoided penetrating the muscular fascia, and observed (in real-time) fat being introduced into the subcutaneous tissue. Wireless ultrasound-guided gluteal fat grafting is an effective and reliable method of visualizing the anatomy of the gluteal region and preventing intramuscular injection of fat. The technology is readily available, very user-friendly and serves as a great learning tool. Based on our positive experience using ultrasound guidance, larger comparative studies should be conducted to confirm its value.

Keywords

fat transfer, tumescent liposuction, liposuction, gluteal fat grafting, ultrasound guided, fat embolism, buttocks, patient safety, subcutaneous tissue, gluteal muscles

Introduction

Gluteal fat grafting (or autologous fat transfer to the buttocks) serves to enhance the contour and projection of the buttocks and is one of the fastest growing procedures in aesthetic plastic surgery due to popularity on social media, rapid recovery times, and high patient satisfaction.^{1,2} During the procedure, fat is harvested from other regions of the body and then injected via a cannula into the gluteal region. However, as the number of gluteal fat grafting procedures has risen, so has the number of fatalities and complications.^{1,2}

Deaths are mainly attributed to intramuscular injection of fat and resultant pulmonary fat embolism.¹ The muscular plane in the gluteal region contains many large caliber vessels, such as the superior and inferior gluteal veins (Figure 1), which can allow a substantial amount of fat to embolize into the central venous system.^{3,4} The exact mechanism of fat embolization into the central venous system is unknown, but it is believed that it is due to either direct inoculation of fat into the large gluteal vessels through the cannula or a pressure gradient created by a lack of particle distribution over several layers of tissues with subsequent flow into the low-pressure veins.⁵ In contrast, the subcutaneous plane is generally devoid

of such large caliber vessels and thus it is much safer to inject fat into this plane.⁴ The American Society of Plastic Surgeons reports that no autopsies have shown a case of death with fat only in the subcutaneous plane; all deaths were associated with fat in the gluteal muscles, fat beneath the muscles, and/or damage to the gluteal veins.⁶ Consequently, there is much concern surrounding injecting fat blindly into the gluteal region. Wireless ultrasound guidance has shown to be an effective tool that allows surgeons to visualize and follow the cannula through the tissue planes in real-time.¹ Essentially, ultrasound enables the surgeon to identify the different tissue planes of the gluteal region (Figure 2). It also helps to avoid intramuscular injection and damage to the gluteal vessels. Wireless ultrasound facilitates the injection of fat exclusively into the subcutaneous tissue and decreases the risk of fat embolism.

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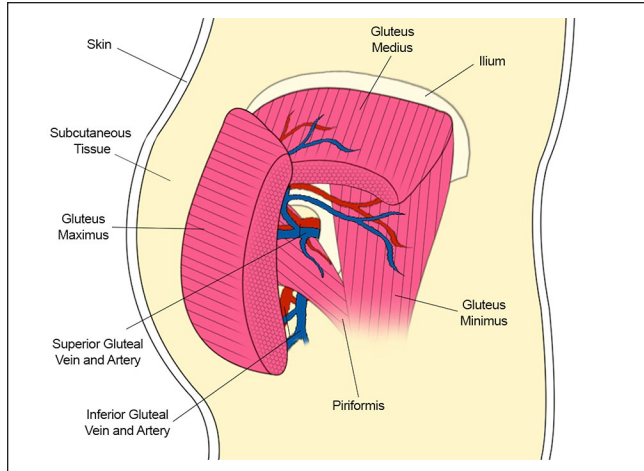


Figure 1. Anatomy of the superior and inferior gluteal vessels in relation to the gluteal muscles and subcutaneous tissue.

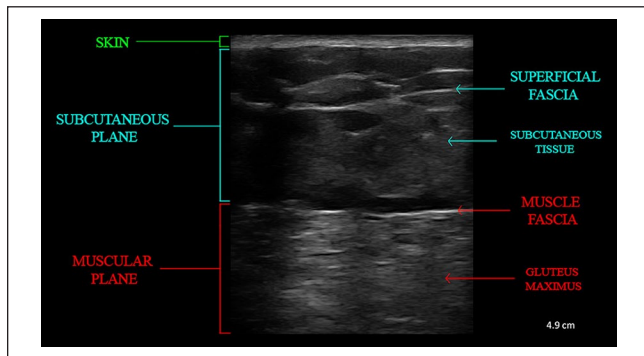


Figure 2. An ultrasound image of the gluteal region of our patient shows the different layers of tissue.

Note. From superficial (top of the figure) to deep (bottom of the figure) the layers are skin, subcutaneous tissue and superficial fascia, muscle fascia, and the gluteus maximus muscle. The depth of the ultrasound image is indicated on the bottom right (4.9 cm).

Although wireless ultrasound-guided gluteal fat can improve patient safety, ultrasound is still underused in many plastic surgery settings.¹ This may be due to increased time of surgery and cost of the device. We report a case of wireless ultrasound-guided gluteal fat grafting in a 36-year-old female to demonstrate the increased safety that can be provided by real-time ultrasound imaging.

Case Report

A 36-year-old female presented with a preoperative diagnosis of lipodystrophy of the abdomen, flanks, and back, buttock ptosis, hypoplastic buttocks, decreased buttock projection, and bilateral trochanteric contour depressions. The patient stated that she was interested in circumferential liposuction with autologous fat transfer to the bilateral buttocks. Risks and benefits of the surgery were explained

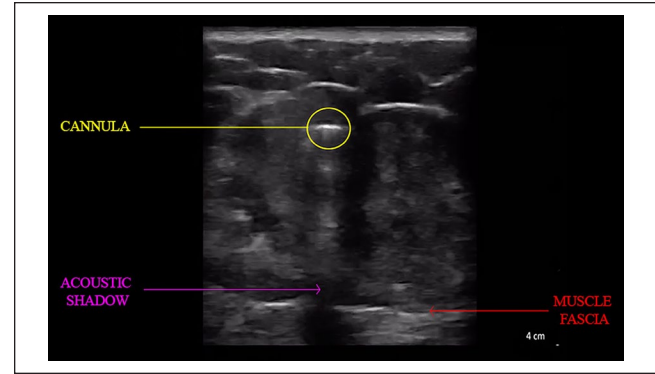


Figure 3. An ultrasound image from our case illustrating the cannula in the subcutaneous tissue/plane.

Note. How the acoustic shadow from the cannula begins in the subcutaneous plane and not the muscular plane; this confirms that cannula is located above the muscle in the subcutaneous plane and that the muscle has not been penetrated. The depth of the ultrasound image is indicated on the bottom right (4.0 cm).

and informed consent was obtained; the patient elected to proceed with the procedure.

On the day of surgery, the patient was reassessed and marked with a pen outlining areas of excess adiposity and contour depression. General anesthesia was administered with endotracheal intubation without incident. A MicroAire (MicroAire Power Assisted Liposuction System; MicroAire Surgical Instruments, LLC, Charlottesville, VA) power-assisted liposuction system was used to perform tumescence and liposuction with the SAFELipo technique. A 3-mm exploded tip blunt cannula was used to inject the tumescent fluid in the subcutaneous layers of the abdomen and flanks. A 5-mm-long port double Mercedes tip cannula was used to aspirate the fat from the abdomen, bilateral abdominal flanks, hips, and back.

The total amount of tumescent infiltrated was 5000 mL with a total volume aspirated of 5000 mL. Harvested fat was allowed to separate by gravity; the bottom layer of tumescent fluid and blood were aspirated into a suction canister and 3500 mL of fat remained. With the patient in the prone position, 1000 mL of fat was injected into each buttock in the subcutaneous plane superficial to the gluteal muscles. This was verified in real-time using the vascular setting on the Clarius Ultrasound scanner L7 (Clarius Mobile Health, Burnaby, British Columbia; see supplemental material for video); the scanner depth was set at 4 to 5 cm and the frequency ranged from 4 to 13 MHz. Ultrasound images were displayed on an Apple iPad 6 (Apple iPad 6th generation; Apple Inc., Cupertino, CA) via the Clarius Ultrasound mobile application (Figure 3). The patient tolerated the procedure well and there was no evidence of any complications.

Discussion

Although gluteal fat grafting has the highest mortality rates out of any aesthetic surgical procedure, it continues to grow

in popularity.³ Mortality is linked to pulmonary fat embolism, which can occur if fat is injected intramuscularly, instead of subcutaneously, in the gluteal region. Therefore, not knowing where fat is being injected is a major safety concern for the patient as well as the surgeon.

While some plastic surgeons believe that intramuscular injection of fat will result in better cosmetic outcomes, studies have shown that there is no significant difference in fat retention between subcutaneous injection and intramuscular injection in the gluteal region.² To minimize risk in our patient and improve the safety of the procedure, the subcutaneous approach was performed under ultrasound guidance. The patient did not have any complications associated with the procedure (such as difficulty breathing, shortness of breath, or a significant decrease in blood pressure) during the intraoperative or postoperative period. Although this technique can help improve patient safety, there are some minor drawbacks to using ultrasound. The use of ultrasound may prolong the time of surgery for inexperienced users and therefore the length of time the patient is under general anesthesia. Also, purchasing an ultrasound device may be difficult for an institution without adequate funding to obtain. Nonetheless, the safety of our patients is of the utmost importance; so, while there are minor drawbacks, the benefits of using wireless ultrasound outweigh any risks of performing gluteal fat grafting blindly.

In conclusion, wireless ultrasound-guided subcutaneous gluteal fat injection has great potential to minimize risk and help prevent adverse outcomes such as pulmonary fat embolism and larger comparative studies should be conducted to solidify its value. Ultrasound allows the surgeon to properly identify the subcutaneous and muscular planes and the location of the cannula in real-time; this reduces any chance of intramuscular injection. It can also help students understand the anatomy of the gluteal region and is an excellent tool for novice surgeons just learning to perform gluteal fat grafting.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed Consent

Written informed consent was obtained from the patient for publication of information and images.

Supplemental Material

Supplemental material for this article is available online.

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Alexander Zuriarrain is a plastic surgeon in Miami, Florida who specializes in aesthetic procedures such as facelift, eyelid surgery, rhinoplasty, breast augmentation and reduction, abdominoplasty, gluteal augmentation with fat transfer, and liposuction. He completed his residency in plastic and reconstructive surgery at Cleveland Clinic Florida and has conducted numerous research projects. He is a fellow of the American College of Surgeons and teaches both medical students and residents.