

Closed-chamber Suction-assisted Fat Harvest: An Innovative Technique in Resource-limited Settings

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Summary: Autologous fat grafting is one of the most commonly performed procedures, not only for cosmetic reasons, but in a variety of reconstructive procedures like correction of contour deformities and treatment of scars. The Coleman technique has been traditionally described as one of the efficient methods of fat harvest, where 10 mL syringes connected with a liposuction cannula are used for the manual harvest of fat; although it is a widely used technique, it becomes time-consuming and tiring when a large amount of fat has to be harvested. To overcome this issue, we have devised a simple, cost-effective, quicker method in resource-limited settings by using a 500-mL normal saline bottle as a closed chamber, which is in turn connected to a suction tube. The liposuction cannula is connected to a tube that is inserted into this closed chamber, where fat is aspirated and collected. Using this technique, a large amount of fat can be easily harvested in less time and with less effort, without damaging the adipocytes. (*Plast Reconstr Surg Glob Open* 2023; 11:e5136; doi: [10.1097/GOX.0000000000005136](https://doi.org/10.1097/GOX.0000000000005136); Published online 20 July 2023.)

INTRODUCTION

Autologous fat grafting is a widely performed procedure. It is commonly performed for posttraumatic deformities, congenital contour deformities, reconstruction after oncological resections, restoration of breast volume after breast tumor resections, aesthetic treatment of scars, skin rejuvenation, radiodermatitis, and even arthritis.¹ The harvested fat contains adipocytes, extracellular matrix, and stromal vascular fraction, which includes adipose-derived stromal cells, endothelial cells, pericytes, and vascular progenitor cells. These adipose-derived stem cells are multipotent cells that regenerate into new adipocytes in the presence of a nonischemic environment.²

The Coleman manual graft harvest technique is the traditional widely accepted technique globally. Coleman described the use of 10 mL Luer Lok syringes for fat aspiration. Digital negative pressure is generated in a 10 mL syringe by gradually withdrawing the plunger of the syringe, which is attached to a 3-mm liposuction cannula. The fat is then sedimented or centrifuged and injected in a three-dimensional lattice pattern into the

recipient site. This atraumatic technique ensures better survival of the fat.³⁻⁵ This procedure, however, can be very tedious and time-consuming when large volumes of fat have to be harvested, especially in patients requiring autologous breast augmentation and large-volume contour abnormalities.

INNOVATION

We have devised an easy, cost-effective, less traumatic, less exhaustive, and faster technique of fat harvest in resource-limited settings where a suction-assisted manual liposuction system is in use. We routinely use the wet technique (Klein solution as tumescent) for fat harvest for the procedure. Under normal circumstances, the liposuction cannulas are connected to a suction device through the noncollapsible suction tubing. This arrangement is very useful when liposuction is being done. However, when the fat harvest is to be performed, collection of such valuable grafts in the unsterile suction containers is unsuitable.

We created a sterile intermediate closed suction chamber using an empty sterile saline glass bottle into which the lipoaspirate can be collected. A glass bottle, preferably 500 mL is sterilized, along with its rubber cork. One end of the suction tubing is connected to the 3-mm

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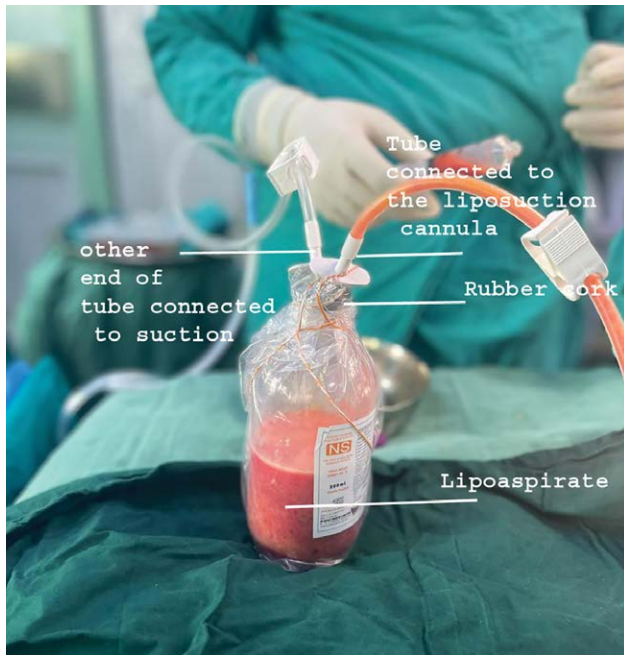


Fig. 1. Suction-assisted closed chamber using saline bottle for fat grafting.

liposuction cannula. The other end is connected to a portable suction apparatus (Fig. 1), the pressure of which is adjustable. The generated pressure of the apparatus is set at -100 to -150 mm Hg.⁶ We routinely use 3-mm Mercedes Benz cannulas for fat harvest. The suction tubing is now transected in the middle. Both the transected ends are inserted into the bottle through the rubber cork, which effectively prevents peritubular leak, thus maintaining adequate intra-chamber negative pressure. The bottle chamber now acts as the suction chamber and receives the lipoaspirate. (See video [online], which shows fat harvesting and collection of lipoaspirate using suction-assisted closed chamber.) The lipoaspirate can be easily emptied into a basin, washed and collected in syringes, and allowed to sediment. After a sedimentation time of 15–20 minutes, the oil and the tumescent solution are decanted, and pure fat is used for injection into the recipient site.

DISCUSSION

Autologous fat grafting has revolutionized both aesthetic and reconstructive plastic surgery. With the advent of the Coleman technique, structural fat grafting has gained more widespread use. Although the Coleman technique is unique, in a high-volume center with a high patient turnover rate, this technique can be very time-consuming and cumbersome.

Various innovations have been described in the literature, owing to an ever-expanding use of fat transfer. Amin et al have described a similar closed suction drainage system using a 16G suction drain with a tubing system.⁷ However, they have found no change in suction

Takeaways

Question: How to harvest a large volume of fat using a manual liposuction cannula in resource-limited settings.

Findings: A large volume of fat can be easily harvested with simple and cost-effective set up using cannulas, sterile saline bottles and suction apparatus in the absence of high end liposuction devices.

Meaning: A closed chamber suction-assisted device is a useful method to harvest fat, especially in resource-limited settings.

pressure with increased bottle filling. Grobmyer et al in their study have found that maximal negative pressure (-71 to 175 mmHg) were generated in all drains, such as Ralivac, Jackson Pratt, and Hemovac, within the reservoir with no fluid. They further observed that pressure generated in all the drain systems decreases as the volume of fluid in the reservoir increases.⁸ In our system, since an external suction apparatus was connected to an intermediate reservoir of the saline bottle where the pressure generated is set and predefined, there is no change in pressure in the intermediate chamber during the procedure of fat harvest.⁷

Codazzi has also used a similar trap device for fat harvest using the reservoir of a wound vacuum therapy system (Medinorm).⁹ Although a low-cost device, vacuum therapy containers may not be very widely available in all the peripheral health care centers or small setups. An empty saline bottle can easily be found in the operation theater and can be easily sterilized as well. It does not require a power-assisted liposuction device, which may not be available at every setup. Braig¹⁰ and Lazzeri¹¹ have also described a similar closed-chamber suction lipoaspiration technique in suction bottles where large volumes of fat can be harvested. Here, we have described a cheap, readily available saline bottle for the same purpose. Alshawaf et al described using a syringe tube as a reservoir. They used 60-cm³ and 10-cm³ syringe barrels for creating negative pressure without breaking sterility.¹²

Suction-assisted lipoaspiration into a closed sterile chamber is a very speedy technique, as the viability of adipocytes has been found to be similar to the various modalities of harvest.

We have not observed any change in the quality of fat harvested compared with other techniques. However, a detailed analysis and case-control study will be required to assess the quality of fat graft, long-term outcome, and other complications. We have been using this technique for the last few years, in more than 20 cases, including hemifacial microsomia, Romberg disease, depressed scar, breast reconstruction, and coup de sabre, etc., and found this technique very useful (Figs. 2 and 3) with no other complications except the usual reabsorption of fat that required repeated fat grafting.



Fig. 2. A case of hemifacial atrophy (Romberg disease) before fat grafting.



Fig. 3. Postoperative result after 1 year of fat grafting.

A small to moderate volume of 300–400 mL of fat can easily be harvested. Although not a novel technique because it follows the same principles of lipoaspiration, we describe a very cost-effective method with readily available types of equipment in resource-limited settings.

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DISCLOSURE

The authors have no financial interests to declare in relation to the content of this article.

PATIENT CONSENT

The patient provided written consent for the use of his image.

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