

Fat reduction

Pathophysiology and treatment strategies

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Learning objectives

After completing this learning activity, participants should be able to describe the pathophysiology driving the development of adipose tissue; recognize the distinct compartments of adipose tissue in each anatomic area; discuss the different available methodologies used for fat removal (invasive, minimally and noninvasive); and choose the appropriate fat removal strategy according to patient profile, goals, and needs.

Disclosures

Editors

The editors involved with this CME activity and all content validation/peer reviewers of the journal-based CME activity have reported no relevant financial relationships with commercial interest(s).

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The advances in understanding the pathophysiology and anatomy of adipose tissue together with the emergence of technological innovations in procedures and devices for fat reduction have led to a dramatic rise in patient demand for this procedure. The objective of this continuing medical education series, which is intended for the novice or experienced dermatologist, is to provide an update of the pathophysiology and anatomic considerations of adipose tissue, and detail the liposuction procedure, from patient selection/management to the latest developments in liposuction devices. Information presented was collected from peer-reviewed literature, the latest guidelines of the American Society of Plastic Surgeons, and the authors' personal clinical experience. The goal of these continuing medical education articles is to assist physicians in providing the best clinical care for their patients who are requesting fat reduction. (*J Am Acad Dermatol* 2018;79:183-95.)

Key words: adipose; energy-assisted liposuction; laxity; liposuction.

Patients are increasingly seeking body contouring procedures, such as liposuction, to help them achieve a healthy looking physique with concomitant improvement in self-image.¹ Liposuction is recognized as one of the most common cosmetic procedures performed in the world, and according to 2016 statistics by the American Society for Aesthetic Plastic Surgery

Americans, liposuction was the most pursued surgical procedure.²

Liposuction is not a novel means of body contouring (Fig 1). Arpad and Giorgio Fischer³ founded modern liposuction with the introduction of hollow cannulas and the cross-tunneling technique.⁴ In 1977, Yves-Gerard Illouz developed the wet technique.^{5,6} A decade later, Jeffrey Klein revolutionized the wet

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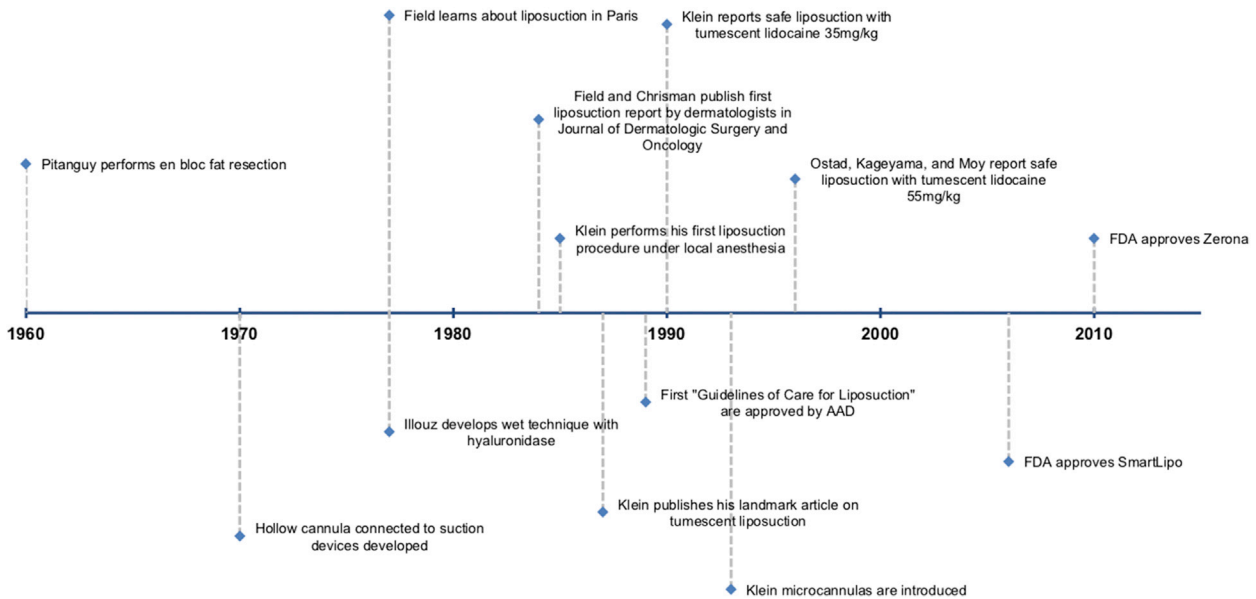


Fig 1. History of liposuction. AAD, American Academy of Dermatology; FDA, US Food and Drug Administration.

technique by developing tumescent anesthesia.^{6,7} This allowed for the treatment of multiple adipose areas while extending anesthesia and inducing vasoconstriction, thereby minimizing blood loss and lidocaine toxicity.^{7,8} Since that time, several evolutions of the liposuction procedure have been developed.

ANATOMIC CONSIDERATIONS OF ADIPOSE TISSUE

Key points

- **There are 3 layers of adipose tissue: superficial, superficial fascia, and deep**
- **The structure and thickness of each layer depends on the anatomic area, gender, and lifestyle**
- **Adipose anatomy differs according to anatomic area**

Liposuction and body sculpting procedures have renewed interest in the anatomy of fat in different anatomic areas. There are 3 layers of fat: a superficial layer, an intermediate membranous layer, known as the superficial fascia, and a deep layer. The depth of each layer depends on an individual's genes, gender, and lifestyle. Liposuction is focused in 2 levels: one in the deep layer to debulk the fat, and a second in the superficial layer to even out the tissue and add definition. The superficial layer is composed of polygonal lobes of fat defined by fibrous septa. The thickness of this layer, assessed by the pinch test, dictates the depth of insertion of the liposuction

cannula. The deep layer contains large, flat lobes of fat, defined by oblique fibrous septa. Distinguishing the superficial from the deep fat layer depends on the anatomic area. For example, in the abdomen, the deep layer is thicker in the periumbilical region, whereas the superficial layer is thicker in the upper abdomen. In the lower body, not only is the division of superficial and deep fat unclear, but the amount of deep fat is minimal. Subsequently, to avoid contour irregularities it is advised to avoid the following areas: the lateral gluteal depression, the infragluteal fold, the inferolateral iliotibial tract, the midmedial thigh, and the infragluteal triangle.⁹

PATHOPHYSIOLOGY OF ADIPOSE TISSUE

Key points

- **Adipose tissue is an endocrine organ with a key role in regulating metabolism**
- **Adipose cells secrete bioactive peptides called "adipocytokines"**
- **Adipose stem cells derived from adipose tissue are being isolated and used in regenerative medicine**

Adipose tissue not only insulates the body and stores energy—it also has a dynamic role in multiple endocrine and metabolic functions.^{10,11} Fat cells regulate the availability of triglyceride and free fatty acid levels in response to insulin, cortisol, and other hormones, and affect glucose metabolism.¹² Adipose tissue also secretes bioactive peptides, called

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