Noninvasive Body Contouring
A Male Perspective

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KEYWORDS

• Body contouring • V-taper • Jawline • Cryolipolysis

KEY POINTS

- Noninvasive body contouring is an attractive therapeutic modality to enhance the ideal male physique.
- An understanding of the body contour men strive for allows the treating physician to focus on areas that are of most concern to men.
- Patients of physicians with an understanding of body counter have an enhanced experience.

INTRODUCTION

The male cosmetic patient tends to gravitate toward treatments that require minimal downtime, involve minimal discomfort, and be associated with no visually apparent side effects. In the realm of body contouring, men place higher value on enhancing a well-defined, strong, masculine jawline and developing a V-shaped taper through the upper body. To achieve this contour, the areas of focus are the submental region, the male chest, the abdomen, and the flanks (**Fig. 1**). Contouring of the lower body, including thighs, knees, and calves, is of lesser importance to men who tend not to develop excessive adiposity in those areas and are typically more interested in developing muscle mass. In this review, we discuss noninvasive body contouring techniques while taking into account the unique aesthetic concerns of the male patient by combining an analysis of the existing literature with our own clinical experience.

SUBMENTAL AND JAWLINE CONTOURING

Cryolipolysis

Cryolipolysis relies on adipocyte response to acute cold injury by inducing a lobular panniculitis, which results in subcutaneous fat layer reduction. Initial proof of concept studies were performed in porcine models with tissue temperatures typically below the freezing point.[1,2] Subsequent clinical work revealed that treatment efficacy is achieved at skin surface temperatures between 10°C and 17°C and subcutaneous fat temperatures between 9°C and 14°C.[3] Cryolipolysis is now widely performed on a large variety of anatomic sites.[4] The male aesthetic patient, however, typically tends to focus on the submentum, the abdomen, the flanks, and the breast. Indeed, clinical trials involving cryolipolysis to otherwise common areas, such as the medial and lateral thighs and the posterior upper arms, have typically lacked male participation even though this population was not directly excluded.[5–7]

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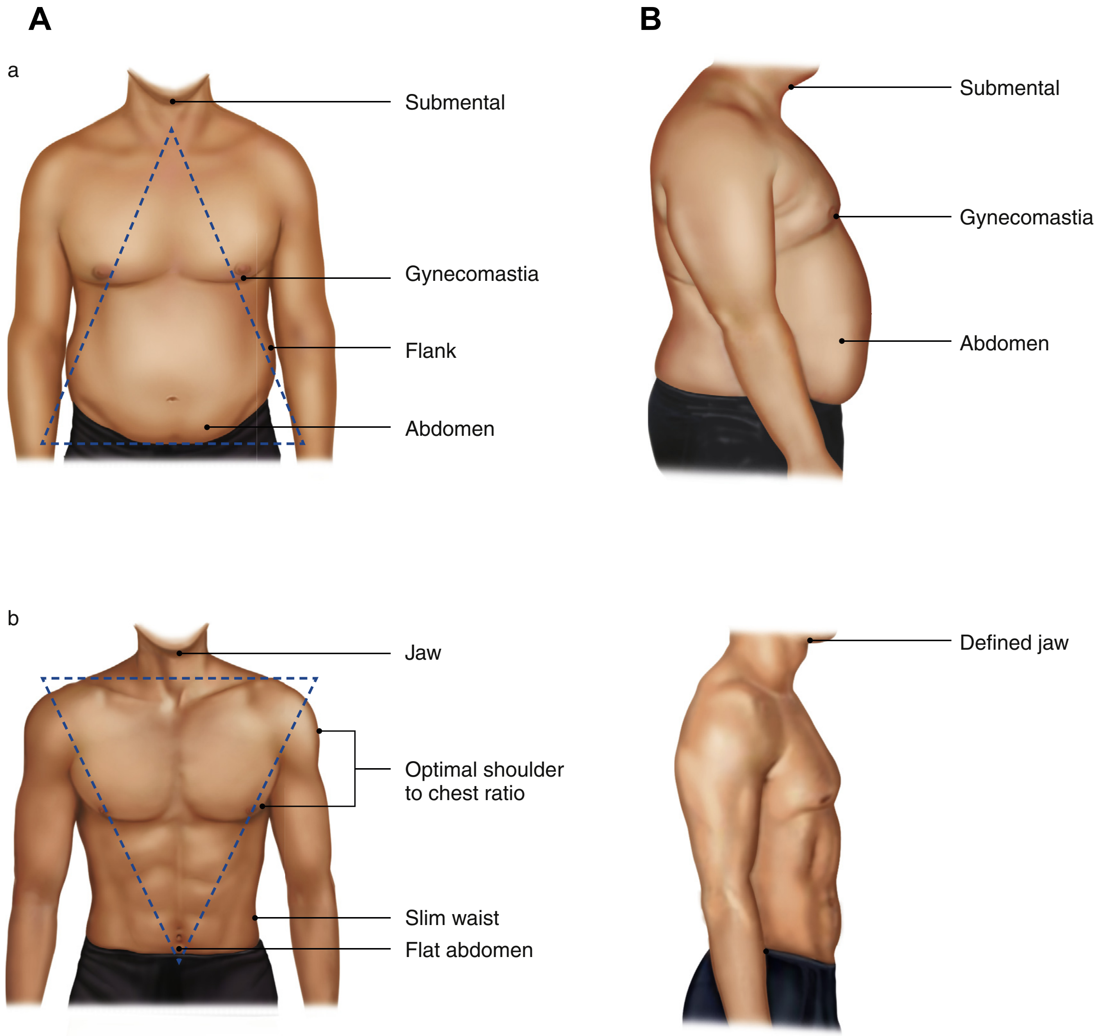

Fig. 1. Ideal male body contour. (*A*) To enhance a pleasing V-tapered shape, excess adiposity in the submentum, chest, abdomen, and flanks (*a*) should be reduced (*b*). (*B*) Side profile.

Excess adiposity in the submental region is a common concern among men. An aesthetically pleasing masculine jawline strongly demarcates the lower face from the neck, and excess submental fat is obscuring. Two prospective clinical trials examining the safety and efficacy of cryolipolysis in this region have been performed with a cumulative male subject proportion of 19% (14 of 74).[8,9] In both trials, one to two treatment cycles were performed 6 weeks apart with a 3-month follow-up. Subjects were generally pleased. Ultrasound measurements detected a roughly 2-mm fat layer reduction.

Synthetic Sodium Deoxycholic Acid

Another option for male submental contouring is injectable synthetic sodium deoxycholate (SDOC). SDOC disrupts adipocyte cell membranes leading to cell death and a subsequent inflammatory response that clears cellular debris. Four phase III randomized, double-blind, placebo-controlled clinical trials have examined the safety and efficacy of SDOC for the reduction of unwanted submental fat.[10–13] These trials included a total of 1744 subjects of which 194 were men who received SDOC (11.1%). Subjects were treated up to 6 times with treatment intervals of 28 days. The results uniformly demonstrated significant submental fat reduction and increased patient satisfaction in the active treatment arm versus placebo. The percentage of subjects who achieved a one-point or greater reduction in submental fat score ranged from 50% to 70% with SDOC versus 20% to 30% with placebo. Two of these trials performed MRI assessment of submental fat reduction[12,13] and found that 40% to 46% of SDOC-treated subjects achieved a 10% volumetric reduction versus 5% with placebo. No increased skin laxity was detected posttreatment.

Successful application of injectable SDOC for submental contouring is heavily dependent on appropriate patient selection. Good candidates for treatment exhibit submental fullness caused by excess subcutaneous fat rather than other causes, such as thyromegaly or lymphadenopathy; do not exhibit excessive platysmal banding or skin laxity; and have not had previous surgical treatments in the area that may complicate subsequent SDOC therapy.[14] Management of patient expectations is also critical because multiple treatment sessions over an extended period of time are typically required to achieve optimal outcomes. Furthermore, unavoidable side effects, such as pain, bruising, and significant edema during and posttreatment, must be fully explained. Simple measures, such as oral ibuprofen or coinjection of lidocaine, can reduce treatment pain.[15,16] Additionally, in our experience, mixing a small amount of triamcinaolone with the SDOC (1–2 mg/mL) produces a significant decrease in pain and treatment-related edema without compromising treatment efficacy.

Subsurface Monopolar Radiofrequency

Subsurface monopolar radiofrequency is a minimally invasive technique that is designed to simultaneous reduce excessive submental adiposity and tighten loose skin of the neck and jawline. The proper application of this technology has the potential to enhance a strong and defined male jawline. By applying heat at temperatures of 55°C to 70°C to the dermal-epidermal junction and subcutaneous fat while maintaining an epidermal surface temperature below 46°C, adipocyte necrosis, dermal neocollagenesis, and epidermal sparing are achieved. Prospective clinical trials involving men using subsurface monopolar radiofrequency have not been published. Two retrospective studies with 17% male participation reported good clinical efficacy and safety.[17,18] In our experience, subsurface monopolar radiofrequency for contouring of the neck and jawline is a pleasing minimally invasive therapeutic option in men.

ENHANCEMENT OF THE V-TAPER

A pleasing V-tapered male body contour relies on an ideal shoulder to chest ratio; a slim waist; and a flat, defined abdomen. This ideal is enhanced by reducing male pseudogynecomastia and unwanted flank and central abdominal fat.

Pseudogynecomastia

One anatomic site that is exclusively a concern among men is the excessive male breast. Pseudogynecomastia is the benign enlargement of the male breast caused by excess subareolar fat. This unwanted fullness tends to be accentuated in the inferior aspect of the male chest, obscuring the ideal V-taper by decreasing the shoulder to chest ratio. Munavalli and Panchaprateep[19] treated 21 men for pseudogynecomastia. Following two treatments, 95% of subjects reported improved visual appearance and 89% reported reduced embarrassment associated with their condition. Additionally, ultrasound measurements detected a mean fat layer reduction of 1.6 mm ± 1.2 mm. We performed a split-breast study in 10 male subjects with pseudogynecomastia and found an 8.12 mm ± 6.94 mm versus a 1.03 mm ± 6.03 mm fat layer reduction by ultrasound measurement in the treated versus untreated breast at 6 weeks post–single cryolipolysis treatment ($P = .03$; Jones and colleagues, unpublished data). Mean patient satisfaction was significantly higher for the treated breast versus the untreated breast (**Fig. 2**). Treatment in this area tends to be well tolerated, although one of the subjects in our trial withdrew because of pain and one subject in the Munavalli trial experienced paradoxic adipose hyperplasia (PAH).

Reduction of Abdominal and Flank Girth

Reducing frontal abdominal protrusion and narrowing of the waist are of paramount importance to men seeking noninvasive body contouring. These areas remain the focus of most noninvasive body contouring technologies including cryolipolysis, nonthermal focused ultrasound, high-intensity thermal focused ultrasound (HIFU), and focus field radiofrequency.

Cryolipolysis

The safety and efficacy of cryolipolysis to the abdomen and flanks is well-documented. There

Fig. 2. Before and after cryolipolysis to the male breast.

are seven prospective clinical trials that have included male subjects.[3,20–25] The cumulative proportion of male subjects was 30% (38 of 127). Fat layer thickness was reduced by 14% to 20% via caliper measurement after one to two treatment sessions corresponding to roughly 40 mL of volumetric loss.[20,21,24] In our experience, cryolipolysis to the abdomen and flanks in the male population is an effective and pleasing treatment (**Fig. 3**). When evaluating male patients for this procedure, particular attention should be paid to the degree of subcutaneous versus visceral fat that is present because cryolipolysis has shown no efficacy in the reduction of visceral abdominal fat.[24]

Adverse events secondary to cryolipolysis tend to be mild and transient, potentially consisting of erythema, edema, bruising, tenderness, and skin numbness.[26,27] Two rarer side effects have been reported in the literature: delayed pain and PAH. Keaney and colleagues[28] performed a retrospective analysis of 125 patients who received 554 cryolipolysis treatments to analyze variables that may influence the development of delayed posttreatment pain. In this study, risk factors identified included young age (mean, 39 years), female gender, and abdominal treatment area. However, all cases of delayed pain were self-limited and resolved within 3 to 11 days without long-term sequelae. Management of this phenomenon includes mild analgesics, such as lidocaine 5% transdermal patch; gabapentin, 300 mg twice daily; and/or acetaminophen with codeine.

PAH is an even rarer potential adverse side effect of cryolipolysis with an estimated incidence of 1 in 20,000.[29] It is thought to be more common in men with potential risk factors including excessive visceral abdominal fat and the presence of firm, nondistensible, fibrous fat within the treatment area.[30] However, further studies are required to isolate the true cause and consequence of PAH following cryolipolysis. Tumescent liposculpture has been suggested as a possible treatment modality for PAH, although a recent case was reported refractory to even this technique.[31]

Radiofrequency

Contactless focused field radiofrequency has demonstrated safety and efficacy in the treatment of excess abdominal girth in men (**Fig. 4**). This technology operates on the principle of oscillating electromagnetic fields that force collisions between charged ions causing the production of heat. When applied specifically to the subcutaneous fat layer, adipose tissue temperatures reach 45°C while skin temperatures remain below 40°C. This selective heating leads to adipocyte apoptosis while sparing the overlying skin.[32] Three prospective clinical trials have been performed assessing the ability of focused field radiofrequency to reduce abdominal circumference.[33–35] A cumulative total of 60 subjects were treated, of which 13 were men (22%). After a series of weekly treatment sessions, these trials demonstrated a 3-cm abdominal circumferential reduction,[33] 5.36-mm reduction in subcutaneous fat layer thickness by MRI,[34] and a 4.17-mm reduction by ultrasound examination[35] at 1 to 3 months post final treatment session. Although the study populations were small, the preclinical and clinical data to date suggest that focused field radiofrequency is a viable therapeutic option for the reduction of unwanted abdominal girth in men. Of note, two clinical trials with this technology have been performed for the contouring of the thigh but of the 82 subjects enrolled, none were men suggesting that this is not an area of high cosmetic concern for men who have an interest in noninvasive body contouring.[36,37]

Ultrasound

The use of ultrasound technology for noninvasive body contouring is divided into nonthermal,

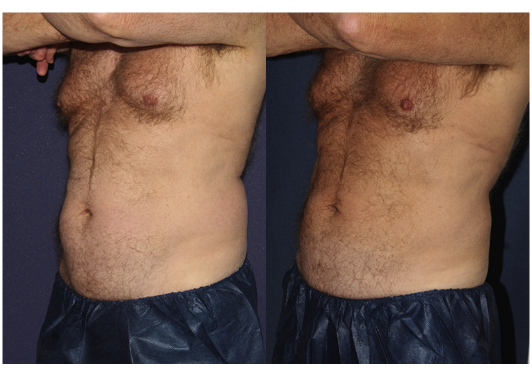

Fig. 3. Before and after cryolipolysis to the abdomen and flanks.

Fig. 4. Before and after contactless focused field radiofrequency of abdomen and flanks.

low-frequency focused ultrasound, and HIFU. Nonthermal focused ultrasound relies on the oscillation and disruption of adipocyte membranes leading to cell death, whereas HIFU transforms ultrasound energy into heat thus leading to adipocyte necrosis. Low-frequency ultrasound delivers mainly mechanical energy that results in cavitation when the negative acoustic pressure supersedes adipocyte membrane adhesion.[38] High-frequency, high-intensity ultrasound produces instantaneous heating of tissues to 55°C to 70°C and results in coagulative necrosis of adipocytes while sparing surrounding tissues and preserving epidermal integrity.[39] In terms of noninvasive body contouring, both technologies have been primarily studied for the reduction of unwanted subcutaneous abdominal fat, although HIFU has also been applied to the ablation of uterine fibroids and nephrolithiasis.

There are four prospective clinical trials studying nonthermal focused ultrasound for abdominal contouring that included men.[40–43] A total of 397 subjects were studied with 76 being men (19%). Three of the four clinical trials demonstrated safety and efficacy of this technology[40–42] with circumferential reductions measured between 1 cm and 4 cm. However, the lone Asian trial failed to demonstrate efficacy of nonthermal focused ultrasound in this patient population.[43] Further work may be required in select patient populations, but overall this technology seems to be safe and effective in reducing unwanted subcutaneous abdominal fat. Because of its nonthermal nature, treatments also tend to be painless and with minimal to no side effects. This is especially attractive to the male cosmetic patient who tends to gravitate toward treatments that require minimal downtime, involve minimal discomfort, and be associated with no visually apparent side effects.

HIFU was first studied for noninvasive ablation of subcutaneous fat in 2009.[44] Six studies looking at the use of HIFU for treatment of abdomen and flanks included male participants. The cumulative proportion of male patients was 18.2 (108 of 592).[45–50] Studies consistently demonstrated mean reduction in waist circumference of 2.06 cm to 2.51 cm after a single treatment at 12-week follow-up. Cumulative energies used ranged from 104 J/cm^2 to 180 J/cm^2 delivered over two to three passes One of the earlier retrospecttive case series published by Fatemi and Kane[45] demonstrated a much higher mean waist circumference reduction of 4.6 cm $\pm$ 2.4 cm after a single treatment. In this study, the mean cumulative energy used was 134.8 J/cm^2 delivered over two passes. The only randomized sham controlled trial compared high-energy (59 $J/cm^2 \times 3$ passes = 177 J/cm^2) and low-energy (47 $J/cm^2 \times 3$ passes = 141 J/cm^2) treatment with sham treatment. At 12-week follow-up, only the high-energy group demonstrated a statistically significant waist circumference reduction of 2.06 cm and higher patient satisfaction compared with sham treatment in the intention-to-treat analysis. However, there was an 8.9% dropout rate, which is fairly high for these types of studies. If these patients were excluded in a per protocol analysis, high- and low-energy treatment groups were significantly improved from sham treatment. Subsequent studies by Robinson and colleagues[49] and Shek and colleagues[20] showed that overall efficacy seems to be determined by cumulative fluence rather than fluence per pass or stacking technique. Robinson and colleagues[49] conducted a multicenter trial comparing 30 J/cm^2 to 60 J/cm^2 per pass, 150 J/cm^2 versus 180 J/cm^2 cumulative fluence, and a grid repeat versus site repeat treatment pattern and showed no significant difference between the treatment groups. There was a mean 2.3 cm $\pm$ 2.9 cm waist circumference reduction at 12 weeks. However, pain was significantly higher in the 60 J/cm^2 protocols. Shek and colleagues similarly demonstrated a 2.1-cm waist circumference reduction using lower fluences per pass (30–55 J/cm^2) on Asian patients. Fluence per pass was adjusted based on pain levels, and 55 J/cm^2 seemed to be the ceiling for most patients.[20] Typically lower fluences are used if a greater number of passes are delivered to achieve equivalent efficacy.

Adverse effects include pain, ecchymosis, edema, erythema, and dysesthesia that are self-limited. Pain is often tolerable with standard oral analgesics. A safety and tolerability split-abdomen study showed mean pain scores (0–10) of 3.5 $\pm$ 2.3 in treated side compared with 0.17 $\pm$ 0.41 on sham treated side.[51] Cholesterol, triglycerides, liver enzymes, complete blood count, and inflammatory markers remained unchanged at Day 1, 3, 7, and 14 posttreatment.[51]

HIFU is an excellent treatment option for males seeking reduction in waist circumference with minimal pain and adverse sequelae. Mean reductions in waist circumference are similar to cyrolipolysis. A small study comparing HIFU with cryolipolysis by our group also found comparable efficacy with substantially more pain and bruising with HIFU.[52]

SUMMARY

Noninvasive body contouring is an attractive therapeutic modality to enhance the ideal male physique. An understanding of the body contour men strive for allows the treating physician to focus on areas that are of most concern to men, thus enhancing patient experience and satisfaction.

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