

Novel Surface Anatomic Landmarks of the Jowl to Guide Treatment with ATX-101

Sachin M. Shridharani, MD, FACS

Summary: Facial appearance is critical to physical attractiveness, and maintaining a youthful face and neck is a major motivation for individuals seeking facial cosmetic procedures. A strong mandibular border without prominent jowls is one sign of a youthful face as jowling occurs with age, contributing to squaring of the face and loss of jawline definition. Excess jowl fat has traditionally been reduced with surgical liposuction when jowling is caused by fat flow across the mandible. The approval of ATX-101 (deoxycholic acid injection) for submental fat reduction provides a minimally invasive technique that may also be suitable for jowl fat reduction. The author has developed novel facial markings that consistently isolate the jowl fat area of concern at the mandible for treatment with ATX-101. The current work refreshes physicians on important jowl anatomical structures, defines the facial markings that consistently isolate the jowl, and describes an injection technique to safely treat excess jowl fat with ATX-101. (*Plast Reconstr Surg Glob Open* 2019;7:e2459; doi: 10.1097/GOX.0000000000002459; Published online 10 October 2019.)

INTRODUCTION

Facial appearance is the most important component of physical attractiveness.^{1,2} Facial attractiveness affects one's self-esteem and how we are judged by others,^{3,4} and trait judgments based on observation of the face occur in as little as 100 ms.⁵ Dissatisfaction with facial appearance, especially the appearance of the chin, neck, and jawline, increases with age.⁶⁻⁹ Maintaining a youthful appearance is a key motivation for individuals seeking facial cosmetic procedures.¹⁰

An oval face shape is considered youthful for females, whereas a square shape is considered attractive for males when the jawline is well defined.¹¹ A distinct mandibular border with no jowl overhang is a sign of a youthful neck.¹² Jowl fat descends with age, contributing to the squaring of the face and loss of jawline definition.¹³ Jowl contouring is therefore a key component of neck rejuvenation, restoring a square face to a more youthful oval shape and

adding definition to the jawline.¹³ Although liposuction has traditionally been the most common method for jowl contouring (used in 81% of cases based on a 2008 survey of dermatologists and plastic surgeons),¹⁴ severe jowling is a contraindication for suction-assisted lipectomy.¹³ Furthermore, many patients are unable or unwilling to undergo this invasive procedure.^{13,15}

Good candidates for isolated jowl fat treatment are typically more youthful individuals with appropriate skin and surrounding soft tissue integrity who will not have skin laxity after decreasing the subcutaneous fat. Minimal ptosis of surrounding structures is also important so as not to increase the aging appearance due to hollowness that can be created. One should look at jowl treatment less as an isolated process but more on the continuum of aesthetic facial rejuvenation. Midface volume restoration, jowling volume augmentation, skin quality improvement, and nonsurgical skin suspension can all aid in improving the patient's overall appearance.

Injection adipocytolysis is a minimally invasive technique that may be suitable for reducing excess jowl fat. ATX-101 (deoxycholic acid injection; Kybella in the United States; Belkyra in Canada, Australia, Europe, and South Korea; Kythera Biopharmaceuticals, Inc., an affiliate of Allergan)^{16,17} is the only injectable adipocytolytic drug approved for reduction of submental fat (SMF). The active ingredient of ATX-101, deoxycholic acid, disrupts

From the private practice (LUXURGERY), New York, N.Y. Received for publication March 25, 2019; accepted July 23, 2019. Medical writing and editorial assistance was provided by Laura Breshears, PhD, of Evidence Scientific Solutions, and funded via an independent grant by Allergan plc, Dublin, Ireland. No payments were made for authorship, and Allergan was not involved in data generation and analysis nor in the development of this manuscript. The product referred to in this study is Kybella (ATX-101; deoxycholic acid injection).

Copyright © 2019 The Author. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](#), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: 10.1097/GOX.0000000000002459

Disclosure: Dr. Shridharani receives writing assistance from and is an advisory board member for Allergan; and is an advisory board member for Galderma, Merz, and Sientra.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com

adipocyte cell membranes when injected subcutaneously into fat, inducing an inflammatory response to clear cellular debris and liberated lipids from the injection site.^{18–23} Since its initial approval in the United States in 2015, practitioners have reported using ATX-101 to reduce areas of localized body fat such as along the bra line.^{24,25} In addition, it has been suggested that ATX-101 may be a suitable treatment for reduction of upper arm, axillary, and knee fat.²⁶ Though treatment of the SMF pad with ATX-101 is well described and the impact on adipocytes is known, use of this drug in other isolated fat pads would be considered “off-label” including the inferior jowl fat pad. The author has extensive experience using ATX-101 for submental contouring.²⁷ This article seeks to refresh physicians on the anatomy of the jowl, identify the anatomic landmarks used to define the jowl treatment area, and describe an injection technique developed to safely reduce jowl fat with ATX-101.

ANATOMIC DESCRIPTION OF THE JOWL

Anatomy

A complete understanding of the anatomy of the lower face and jowl is critical for practitioners to safely and effectively administer ATX-101 for jowl fat reduction. Jowl fat consists of the superior fat pad, which extends from the nasolabial fold and approximates the oral commissure, and the inferior fat pad, which abuts the superior fat pad and inferiorly reaches the mandibular border.²⁸ The mandibular septum acts like a sling below the jowl fat pads, separating them from the submandibular fat pad.²⁸

The inferior jowl fat pad overlays important neurovascular structures at the mandible. The facial artery and vein cross the mandible at the antegonial notch, supplying blood to the superficial tissues of the face.²⁹ The marginal mandibular nerve (MMN) supplies the muscles of the lower lip and runs along the mandible superficial to the facial artery and vein (Fig. 1A).³⁰ This nerve runs beneath the platysma muscle and innervates its target muscles on their deep surface. Cadaver studies show that, posterior to the facial artery, the MMN follows the angle of the mandible in 52% of cases, is found approximately 1.1 to 1.6cm below the mandible in 32% of cases, and

runs above the mandible in 16% of cases.³⁰ Anterior to the facial artery, the MMN is always above the inferior border of the mandible.^{30,31}

Jowling Mechanisms

Jowling can be caused by ptosis, mandibular septum dehiscence, and/or atrophy of subcutaneous tissue.³² Jowl ptosis occurs when the subcutaneous jowl fat compartments shift inferiorly and can be accompanied by development of the submalar hollow. Dehiscence of the mandibular septum can allow fat to flow across the mandible, resulting in jowling. Atrophy of subcutaneous tissue can reveal underlying jowls and is associated with thin sagging skin and little subcutaneous fat in the jowl area. Midface descent also exacerbates the appearance of the jowl secondary to skin and soft tissue ptosis cranial to the jowl. In addition, mild to moderate mandibular atrophy leads to deepening of the prejowl sulcus and ptosis of the overlying soft tissue, resulting in the appearance of prominent jowls.³³

PROCEDURE FOR MARKING AND TREATING THE JOWL

Patient Selection

An understanding of a patient’s jowling mechanism is critical for selecting appropriate candidates for ATX-101 treatment. A patient with jowling caused by compartment displacement (ptosis) would benefit from surgery to elevate the superficial musculoaponeurotic system to return the fat pads to a superior position, whereas a patient presenting with jowling due to atrophy of subcutaneous tissue would be contraindicated for a fat-reducing treatment such as ATX-101.³² In contrast, a patient with jowling due to fat flow across the mandible would be an appropriate candidate for fat reduction at the jowl.³² The jowling mechanism is determined through visual inspection and palpation of the area. To consider ATX-101 as a treatment option, there should be visible focal fullness at the jowl and discernible subcutaneous fat upon palpation. Patient preference for treatment modality should also be taken into consideration, as well as patient expectations. Because other aging changes of the face likely occur in

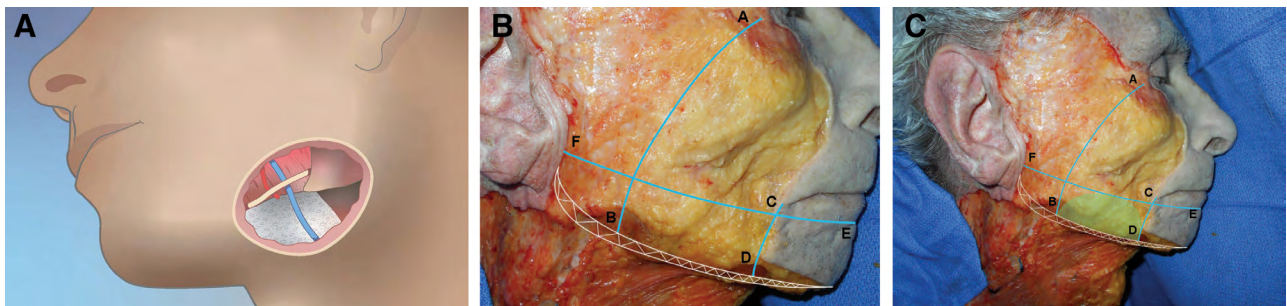


Fig. 1. Anatomic study of the face and jowl. Left, Diagram of important neurovascular structures that mark the posterior border of the jowl fat pad. The facial artery is the red vessel, the facial vein is the blue vessel, and the MMN is the yellow structure that is perpendicular to the facial artery and vein. Middle, Male cadaver with digital overlay of markings to isolate the jowl fat treatment area. A, lateral canthus; B, antegonial notch; C, oral commissure; D, prejowl sulcus; E, midline labiomental sulcus; F, ear lobule. White hatched area is the zone of MMN innervation at the inferior border of the mandible. Right, Green shaded area is the inferior jowl fat pad.

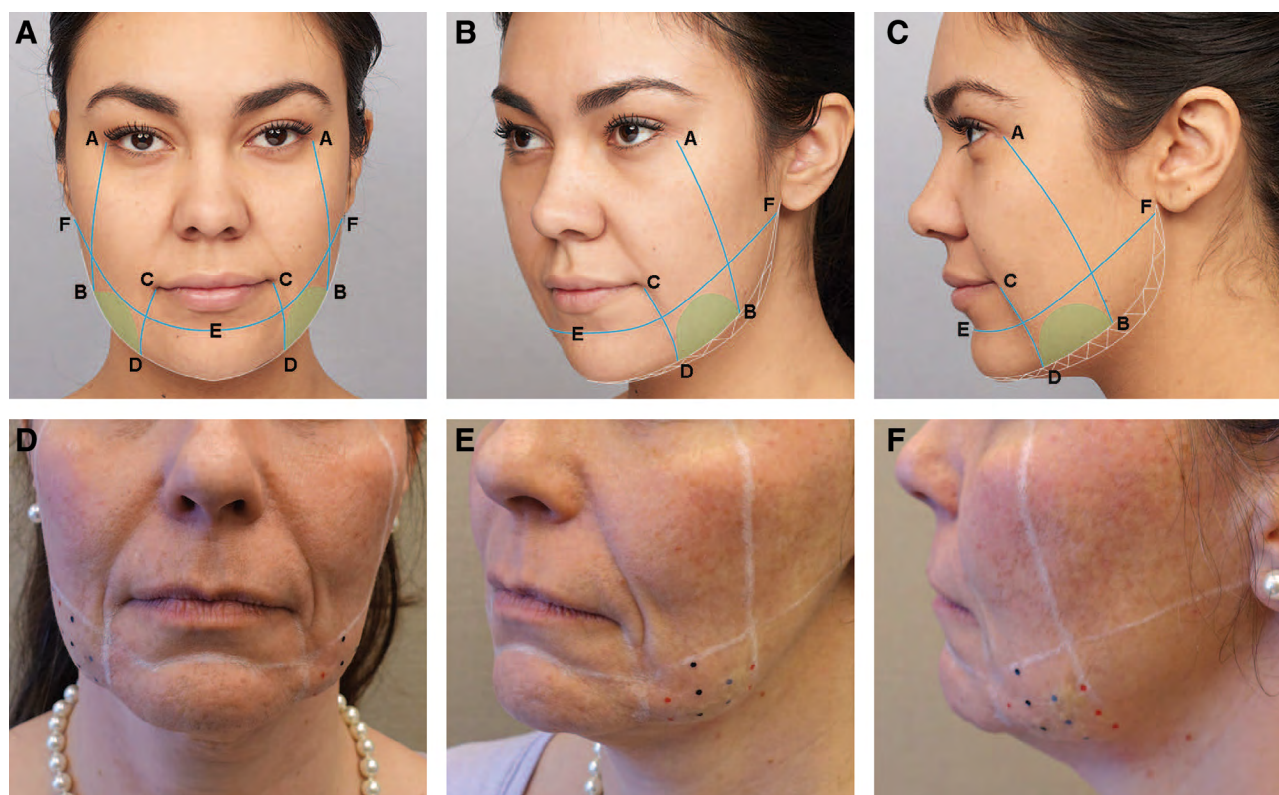


Fig. 2. Marking and treating the jowl. Top, Diagram of facial markings used to isolate the jowl. A, lateral canthus; B, antegonial notch; C, oral commissure; D, prejowl sulcus; E, midline labiomental sulcus; F, ear lobule. White hatched area is the zone of MMN innervation at the inferior border of the mandible. Green shaded area is the inferior jowl fat pad. Facial markings and grid placement on, bottom, a 51-year-old female patient before ATX-101 treatment of jowl fat. Patient had not received any previous jowl or neck treatments.

addition to jowling, some patients may be better candidates for surgical rejuvenation.

Facial Markings Used to Isolate the Jowl

To date, no consistent, anatomically correlated surface markings have been defined to identify and isolate the jowl for injectable treatment. To confirm the location of the inferior jowl fat pad and identify consistent anatomic borders, 4 cadaver heads (obtained from the Maryland State Anatomy Board) were marked and dissected (dissections took place at the University of Maryland Medical Center, Baltimore, MD; Fig. 1B). One cadaver was male, 3 were females, and all were white, with an age range of 66–80 years. One hemiface was dissected to identify landmarks, and then the contralateral hemiface was marked and dissected to confirm isolation of the desired area. The jowl fat was located each time within the markings.

To isolate the jowl treatment area on patients, the standard anatomical points identified in the cadaver dissections are located and marked (Fig. 2A). The lateral canthus and antegonial notch are identified, and a line extending over the mandible is drawn between them. Similarly, a line is drawn from the oral commissure to the prejowl sulcus. These lines serve to mark the posterior and anterior borders of the jowl treatment area, respectively. Next, a line is drawn from the labiomental sulcus to the ear lobule to mark the superior border of the treatment area. Finally,

a line from the prejowl sulcus to the ear lobule is drawn along the inferior mandible to form the inferior border of the treatment area. The treatment area is verified with palpation and pinching to confirm the presence of subcutaneous fat. Patients are also asked to view the isolated area and agree that it is the area of concern. Clinical correlations for markings were consistent among 500 patients evaluated by the author using the above technique.

Treating the Jowl

Once facial markings are made, the 1.0-cm grid recommended for use with ATX-101 when treating SMF is applied to the jowl treatment area (Fig. 2B), and 0.2-mL injections are administered using a 0.5-in, 32-gauge needle next to the dots on the grid. If the surface area is relatively small, 0.1-mL injections can be administered at 0.5- to 0.75-cm intervals. Proper injection technique is critical for successful jowl treatment. The physician should pinch jowl fat with the noninjecting hand and lift away from underlying structures while injecting (See Video [online], which demonstrates the injection technique for treating jowl fat with ATX-101. Injections should be administered perpendicular to the surface of the skin and midway into the subcutaneous fat (about 6–10 mm). If dermal blebbing is observed during administration, injections may be too superficial, and the needle should be gently pushed deeper into the underlying fat. Avoid being

overly aggressive or injecting superiorly to the isolated jowl fat pad. Massage is not recommended directly after ATX-101 injection because this may displace the medication into surrounding (nontarget) tissues.

SAFETY CONSIDERATIONS

Anatomic structures deep to the jowl fat compartment, including the MMN, facial vein, and facial artery, can be injured if exposed to ATX-101. MMN paresis was reported with ATX-101 in the phase 3 clinical trials supporting the indication for reduction of SMF.^{34,35} Additionally, injection of ATX-101 into the facial artery may cause skin necrosis.³⁶ Although the MMN is superficial to the facial artery and vein, it is deep underneath the subcutaneous fat and platysma muscle. Therefore, proper isolation of the jowl fat and appropriate injection technique will minimize the risk of MMN injury. A pinch and pull/retract technique helps isolate the target tissue from underlying neurovascular structures. The author favors pre-ATX-101 injection with a small volume of lidocaine with epinephrine. Smile asymmetry observed after lidocaine injection indicates that the injection site may be too close to the MMN, and the depth of injection of ATX-101 should be adjusted superficially to avoid this area. Other concerns include alopecia and ulceration. Temporary alopecia may occur at the injection site,^{37,38} and male patients should be advised of this potential side effect. Skin ulceration is a concern with superficial injection,³⁴ so appropriate depth is critical to target the subcutaneous fat and avoid this adverse event.

CONCLUSIONS

Determination of the jowling mechanism and patient preference should direct treatment decisions. It is important to standardize isolation of the jowl fat treatment area to achieve consistent outcomes and reduce potential complications. Standard anatomic landmarks are used to guide isolation of the treatment area. The markings described in this article are meant to be consistent regardless of sex, body type, or severity of jowl fat. The jowl area is safe to inject if accurately isolated and proper injection technique is used.

Sachin M. Shridharani, MD, FACS
880 Fifth Avenue, #1B/C/D
New York, NY 10021
E-mail: sms@luxsurgery.com

REFERENCES

- Alley TR, Hildebrandt KA. Determinants and consequences of facial aesthetics. In: Alley TR, ed. *Social and Applied Aspects of Perceiving Faces*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1998:101–140.
- Patzer GL. Understanding the causal relationship between physical attractiveness and self-esteem. *J Esthet Dent*. 1996;8:144–147.
- Patzer GL. Self-esteem and physical attractiveness. *J Esthet Dent*. 1995;7:274–277.
- Zebrowitz LA, Montepare JM. Social psychological face perception: why appearance matters. *Soc Personal Psychol Compass*. 2008;2:1497.
- Saegusa C, Watanabe K. Judgments of facial attractiveness as a combination of facial parts information over time: social and aesthetic factors. *J Exp Psychol Hum Percept Perform*. 2016;42:173–179.
- Ehlinger-Martin A, Cohen-Letessier A, Taïeb M, et al. Women's attitudes to beauty, aging, and the place of cosmetic procedures: insights from the QUEST observatory. *J Cosmet Dermatol*. 2016;15:89–94.
- Honigman R, Castle DJ. Aging and cosmetic enhancement. *Clin Interv Aging*. 2006;1:115–119.
- Jagdeo J, Keaney T, Narurkar V, et al. Facial treatment preferences among aesthetically oriented men. *Dermatol Surg*. 2016;42:1155–1163.
- Narurkar V, Shamban A, Sissins P, et al. Facial treatment preferences in aesthetically aware women. *Dermatol Surg*. 2015;41(Suppl 1):S153–S160.
- Chauhan N, Warner JP, Adamson PA. Perceived age change after aesthetic facial surgical procedures quantifying outcomes of aging face surgery. *Arch Facial Plast Surg*. 2012;14:258–262.
- Goodman GJ, Subramanian M, Sutch S, et al. Beauty from the neck up: introduction to the special issue. *Dermatol Surg*. 2016;42(Suppl 1):S260–S262.
- Ellenbogen R, Karlin JV. Visual criteria for success in restoring the youthful neck. *Plast Reconstr Surg*. 1980;66:826–837.
- Patel BC. Aesthetic surgery of the aging neck: options and techniques. *Orbit*. 2006;25:327–356.
- Schlessinger J, Weiss SR, Jewell M, et al. Perceptions and practices in submental fat treatment: a survey of physicians and patients. *Skinmed*. 2013;11:27–31.
- Koehler J. Complications of neck liposuction and submentoplasty. *Oral Maxillofac Surg Clin North Am*. 2009;21:43–52, vi.
- Kybella (deoxycholic acid) injection [prescribing information]. 2015. Available at: https://www.allergan.com/assets/pdf/kybella_pi. Accessed July 10, 2018.
- Belkyra (deoxycholic acid injection) [product monograph]. 2016. Available at: http://allergan-web-cdn-prod.azureedge.net/allergancanadaspecialty/allergancanadaspecialty/media/actavis-canada-specialty/en/products/pms/belkyra-pm-2016-03-28_e.pdf. Accessed July 10, 2018.
- Duncan D, Rubin JP, Golitz L, et al. Refinement of technique in injection lipolysis based on scientific studies and clinical evaluation. *Clin Plast Surg*. 2009;36:195–209, v–vi; discussion 211–213.
- Rotunda AM. Injectable treatments for adipose tissue: terminology, mechanism, and tissue interaction. *Lasers Surg Med*. 2009;41:714–720.
- Rotunda AM, Suzuki H, Moy RL, et al. Detergent effects of sodium deoxycholate are a major feature of an injectable phosphatidylcholine formulation used for localized fat dissolution. *Dermatol Surg*. 2004;30:1001–1008.
- Thuangtong R, Bentow JJ, Knopp K, et al. Tissue-selective effects of injected deoxycholate. *Dermatol Surg*. 2010;36:899–908.
- Walker P, Lee D, Toth BA. A histological analysis of the effects of single doses of ATX-101 on subcutaneous fat: results from a phase 1 open-label safety study of ATX-101. Paper presented at: the American Society for Dermatologic Surgery Annual Meeting; October 3–6, 2013; Chicago, IL.
- Yagima Odo ME, Cucé LC, Odo LM, et al. Action of sodium deoxycholate on subcutaneous human tissue: local and systemic effects. *Dermatol Surg*. 2007;33:178–188; discussion 188–189.
- Jegasothy SM. Deoxycholic acid injections for bra-line lipolysis. *Dermatol Surg*. 2018;44:757–760.
- Verma KD, Somenek MT. Deoxycholic acid injection as an effective treatment for reduction of posterior upper torso brassiere strap adiposity. *Plast Reconstr Surg*. 2018;141:200e–202e.
- Sykes JM, Allak A, Klink B. Future applications of deoxycholic acid in body contouring. *J Drugs Dermatol*. 2017;16:43–46.

27. Shridharani SM. Early experience in 100 consecutive patients with injection adipocytolysis for neck contouring with ATX-101 (Deoxycholic Acid). *Dermatol Surg.* 2017;43:950–958.
28. Reece EM, Pessa JE, Rohrich RJ. The mandibular septum: anatomical observations of the jowls in aging-implications for facial rejuvenation. *Plast Reconstr Surg.* 2008;121:1414–1420.
29. Kenkel JM, Jones DH, Fagien S, et al. Anatomy of the cervico-mental region: insights from an anatomy laboratory and round-table discussion. *Dermatol Surg.* 2016;42(suppl 1):S282–S287.
30. Batra AP, Mahajan A, Gupta K. Marginal mandibular branch of the facial nerve: an anatomical study. *Indian J Plast Surg.* 2010;43:60–64.
31. Baur DA, Kaiser AC, Leech BN, et al. The marginal mandibular nerve in relation to the inferior border of the mandible. *J Oral Maxillofac Surg.* 2014;72:2221–2226.
32. Reece EM, Rohrich RJ. The aesthetic jaw line: management of the aging jowl. *Aesthet Surg J.* 2008;28:668–674.
33. Romo T, Yalamanchili H, Sclafani AP. Chin and prejowl augmentation in the management of the aging jawline. *Facial Plast Surg.* 2005;21:38–46.
34. Humphrey S, Sykes J, Kantor J, et al. ATX-101 for reduction of submental fat: a phase III randomized controlled trial. *J Am Acad Dermatol.* 2016;75:788–797.e7.
35. Jones DH, Carruthers J, Joseph JH, et al. REFINE-1, a multicenter, randomized, double-blind, placebo-controlled, phase 3 trial with ATX-101, an injectable drug for submental fat reduction. *Dermatol Surg.* 2016;42:38–49.
36. Sachdev D, Mohammadi T, Fabi SG. Deoxycholic acid-induced skin necrosis: prevention and management. *Dermatol Surg.* 2018;44:1037–1039.
37. Dayan SH, Schlessinger J, Beer K, et al. Efficacy and safety of ATX-101 by treatment session: pooled analysis of data from the phase 3 REFINE trials. *Aesthet Surg J.* 2018;38:998–1010.
38. Grady B, Porphirio F, Rokhsar C. Submental alopecia at deoxycholic acid injection site. *Dermatol Surg.* 2017;43:1105–1108.

