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Best Clinical Practices with ATX-101 for Submental Fat Reduction: Patient-related Factors and Physician Considerations

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Background: Submental fat can be reduced with ATX-101 (deoxycholic acid injection), a customizable and minimally invasive alternative to liposuction. In the years since its approval, the treatment patterns of ATX-101 have evolved.
Methods: A panel of experienced physicians from the United States gathered to generate best practices for the use of ATX-101 in submental contouring.
Results: The expert panel provided their insights on appropriate patient selection, managing patient expectations of ATX-101 treatment outcomes, and adverse events, and guidance on ATX-101 administration for optimal outcomes are presented here.
Conclusion: These best clinical practices on the use of ATX-101 for the reduction of submental fat should enable physicians to enhance the patient treatment experience and outcomes. *(Plast Reconstr Surg Glob Open 2021;9:e3668; doi: 10.1097/GOX.0000000000003668; Published online 12 July 2021.)*

INTRODUCTION

Submental fat (SMF) can contribute to an unappealing fullness under the chin and jawline area, adversely affecting facial appearance and psychological well-being.[1,2] Nearly three-quarters of aesthetic patients expressed concern about excess fat underneath their chin[3]; almost two-thirds would like to safely reduce it.[4]

Standard treatment to improve submental contour often includes liposuction; however, surgery may not be suitable for or desired by all patients.[5,6] Although effective and often optimal to treat patients with submandibular

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fullness, surgery has risks associated with anesthesia, infection, nerve injury, bleeding, and scarring.[5]

ATX-101, the noncommercial name used for synthesized deoxycholic acid [DCA injection; Kybella (United States)/Belkyra (Australia, Canada, Europe, South Korea); Kythera Biopharmaceuticals, Inc. (an affiliate of Allergan)] offers a minimally invasive alternative for improving submental contour and was approved in 2015 as a first-in-class injectable drug for improving the appearance of moderate to severe convexity or fullness associated with SMF.[7,8] The synthesized active ingredient of ATX-101 is structurally similar to endogenous DCA, a secondary bile acid that is a metabolic byproduct of intestinal bacteria.[9] Injection of ATX-101 into fat causes adipocytolysis; histologic analysis of ATX-101-treated tissues shows that at 1 day postinjection, fat cell membrane lysis had occurred, leading to cellular destabilization.[10,11] Neutrophilia, a hallmark of irreversible tissue injury, was visible by day 3, and macrophage infiltration to remove cellular debris and liberated lipids was visible by day 7. Fibroblast proliferation, thickening of fibrous septae (indicative of collagen production), and inflammation remission were observed by day 28. Physiologically, ATX-101 injections increase lipid plasma levels, similar to what occurs after a meal.[9]

The ATX-101 approval was based partly on two randomized, double-blind, placebo-controlled phase 3 trials conducted in the United States and Canada (REFINE-1 and REFINE-2)[12,13] of 1022 adults with moderate or severe SMF.[14] Both trials demonstrated the safety and effectiveness of ATX-101 treatment for reducing SMF and its negative psychological impact, while increasing patient satisfaction with their face/chin appearance.[12,13] Outside the clinical trial setting, postmarketing data from the observational Condition of Submental Fullness and Treatment Outcomes Registry (CONTOUR) demonstrated that, with optimal ATX-101 treatment, patients can achieve a clinically meaningful reduction in SMF.[15,16]

In April 2018, physicians with ATX-101 clinical experience convened to align on best clinical practices regarding its standalone use for submental contouring. This article offers their insights for optimizing ATX-101 treatment in clinical practice and provides an overview of treatment practice patterns since its approval.

SELECTING PATIENTS FOR ATX-101 TREATMENT

Appropriate patient selection is key to ensuring optimal outcomes and reducing the risk of adverse events (AEs). In contrast to regulatory approvals, which are for moderate to severe SMF,[7,8] postapproval clinical experience indicates that most patients treated with ATX-101 have mild (80%) or moderate (20%) SMF, which may be due to the likelihood of patients to select minimally invasive instead of surgical treatments for less severe cases. A standardized physical examination is recommended before initiating ATX-101 treatment (Table 1). This physical examination should screen for potential problems, including the location of SMF (preplatysmal versus subplatysmal) (see Table 1 for more details) and other causes of SMF[7] (eg, thyromegaly, cervical lymphadenopathy, prominent submandibular glands, low/anterior hyoid bone, and strong digastric muscle). Validated rating scales can be used to evaluate submental fullness/convexity.[9,17]

Table 1. Recommended Assessments to Include in a Physical Examination to Ensure Appropriate Patient Selection for ATX-101 Treatment

- View the patient in the Frankfort plane and have the patient say "E" to engage the platysmal and digastric muscles
- Palpate treatable submental fat (SMF), distinguishing it from masses, irregularities, and moderate to severe submandibular glands that mimic SMF and won't respond to ATX-101 treatment
- Determine whether preplatysmal fat is present because it will be associated with better outcomes. With the patient in a neutral position (Frankfort horizontal plane), the physician pinches and palpates the central submentum, then asks the patient to strain the neck (eg, showing lower teeth, saying "E" strongly) while still pinching the submentum. The tissue that easily pulls away when flexing the platysma is both the platysma and subplastysmal fat. The remaining tissue in the hand is skin and subcutaneous fat
- Check patient's smile for asymmetry that may have resulted from marginal mandibular nerve injury following treatment
- Evaluate patients for severe submental skin laxity, which may require skin tightening or alternative therapy
- Identify long or wide platysmal bands; prominent platysmal bands may require subsequent aesthetic treatment (likely with neuromodulators) to address the exposed platysmal bands once the SMF is reduced. Older patients should be counseled that bands could become more prominent with skeletonization of the muscle during fat reduction
- Document position of hyoid bone; if low, injection points for ATX-101 may be more difficult to determine to achieve ideal outcomes because lateral (versus lower) convexity is more easily addressed with ATX-101 treatment
- Have patient place tongue on roof of mouth to check for digastric muscle hypertrophy. Patients should be counseled that with both digastric hypertrophy and excess submental fat, the ideal contour may not be achieved although ATX-101 treatment can still be performed
- Evaluate for mandibular hypoplasia, which is not ideal for ATX-101 treatment

Physicians should consider first the complexities of neck aging and lower facial aging to determine if the patient is a good candidate for ATX-101. It is important to evaluate the complexities of jawline and neck changes that occur with aging, such as skin laxity, platysmal muscle diastasis, mandibular resorption, ptosis of submandibular glands, as well as increased jowl and SMF, along with the patient's clinical history.[1,18] Patients with mild or moderate submental skin laxity may be treated with ATX-101. Over 90% of the ATX-101–treated patients in the REFINE or open-label clinical trials showed either improvement or no change in laxity.[12,13,19] However, patients with severe submental skin laxity or excess subplatysmal fat may be better served by alternative therapies to address SMF or skin-tightening therapy in combination with ATX-101 treatment.[12,13,19] Treatment of SMF can unmask platysmal bands; patients with long/wide platysmal bands will not have an ideal outcome after SMF reduction. Platysma muscle diastasis may also contraindicate the use of ATX-101.[18] In our experience, many patients opt for ATX-101 treatment if they are aware that the contour will improve and that platysmal bands can be effectively treated with neuromodulators. In addition, ATX-101

can effectively treat jowl appearance only in patients with jowling caused by fat flow over the mandible without major superior compartment ptosis.[18] Injection site infection is also a contraindication for ATX-101 treatment.[7] Patients with prior surgical or aesthetic treatment of the submental area, scar tissue in the submental area, or a history of dysphagia or marginal mandibular nerve (MMN) injury may have an increased risk for AEs following ATX-101 treatment.

During the initial consultation, alternative procedures such as liposuction or cryolipolysis should be considered based on patient history, physical examination, and patient preference. Since ATX-101 treatment requires multiple treatment sessions, cost of the recommended treatment plan for optimal outcomes should be reviewed. In our experience, male patients with beards tend to respond well to ATX-101 treatment and often stop wearing a beard once their contour has improved. In addition, male patients tend to present with more severe SMF and have less submental skin laxity relative to female patients due to thicker dermis. Male patients seek out ATX-101 treatment less often than females, but once they did, treatment-naive men returned for additional treatments at higher rates than women (19%–27% versus 12.9%–16.1%, respectively).[20,21]

MANAGING PATIENT EXPECTATIONS OF ATX-101 TREATMENT

Patients may initially have unrealistic expectations for results, especially if they have prior experience with other injectable treatments like botulinum toxins or hyaluronic acid fillers. Unlike these treatments, the full treatment effects of ATX-101 take a few months, as the SMF is gradually reduced and tissue remodeling takes place.[22] Individuals may have varied response with respect to level of response and how many treatments are needed before achieving response.[14] ATX-101 treatment will be individually tailored based on the patient's SMF severity, as well as treatment goals and response. A lack of patient education may negatively affect compliance with a full course of treatment. Compliance may be improved by discussing and offering full treatment packages executed over time. Each patient should be counseled to establish realistic expectations regarding the number of treatments required to achieve optimal results, frequency/severity of AEs, potential social downtime, and likely treatment outcome. The physician's treatment goal should align to achieve patient satisfaction rather than to a specific clinical outcome.

MANAGING EXPECTATIONS OF ATX-101 TREATMENT OUTCOMES

The response to treatment may vary among patients, and success may not equate to achievement of a certain grade of improvement (as in the efficacy evaluations in clinical trials[12,13]). Representative before/after treatment photographs of patients with similar submental anatomy, as well as before/after treatment photographs of the patient can be helpful to set and maintain realistic expectations and to assess ongoing responses (Figs. 1, 2). [**See figures, Supplemental Digital Content.** Supplemental Figure 1 displays additional representative before/after treatment photographs of a 41-year-old patient with moderate submental fat at baseline who received three ATX-101 treatments (total combined volume, 18 mL); time between last treatment and after photograph was 1 month, 5 days. Supplemental Figure 2 displays additional representative before/after treatment photographs of a 71-year-old patient with moderate submental fat at baseline who received one ATX-101 treatment (total volume, 5 mL); time between before and after photographs was 2 months, 25 days. Supplemental Figure 3 displays additional representative before/after treatment photographs of a 27-year-old patient with moderate submental fat at baseline who received two ATX-101 treatments (total combined volume, 11 mL); time between last treatment and after photograph was 1 month, 26 days. **http://links.lww.com/PRSGO/B690**.]

We recommend standardized photography using Frankfort plane for positioning (Table 1) at every visit, including non-treatment follow-up visits, to track patients' progress over time. Patient-assessed rating scales can also be used to evaluate satisfaction and clinically meaningful outcomes.[12,13,15,16]

Multiple injections at each treatment across multiple sessions will be required to achieve a satisfactory reduction in SMF. Based on the clinical development program for ATX-101, up to six treatments with as many as 50 injections/treatment may be administered at intervals no less than 1 month apart.[7] In a pooled analysis of the phase 3 REFINE trials, the majority of ATX-101–treated patients achieved a one-grade improvement or greater in SMF from baseline based on either clinician or patient assessment within two (52.2% or 47.3%, respectively) to four treatments (71.5% or 74.1%).[14] These reductions were almost exclusively preplatysmal fat (~25% loss as evidenced by MRI).[23] Nearly 20% of patients in the REFINE trials received less than six treatments owing to patient satisfaction or lack of sufficient SMF for continued treatment.[14] The CONTOUR study found that most patients achieve satisfactory outcomes with two to four treatments.[15] Based on postapproval experience and feedback from clinicians, patients with mild SMF typically receive two to three ATX-101 treatments (two to three vials/treatment), whereas patients with moderate SMF typically receive two to four treatments (two to three vials/treatment). The typical interval between ATX-101 treatments is 6–8 weeks with longer intervals between later treatments. The patient should be informed that significant weight gain during ATX-101 treatment may increase the likelihood of suboptimal outcomes.

MANAGING EXPECTATIONS OF SWELLING/EDEMA AND DOWNTIME ASSOCIATED WITH ATX-101

Patients should be advised that swelling/edema is a common AE, reflective of the mechanism of action of ATX-101 and indicating that the treatment is in progress.[10] Swelling/edema was reported in 78.1% of ATX-101–treated patients in the REFINE trials with a median duration of 10–11 days.[14] Reduced duration of swelling/edema was often seen with subsequent ATX-101 treatments[14]

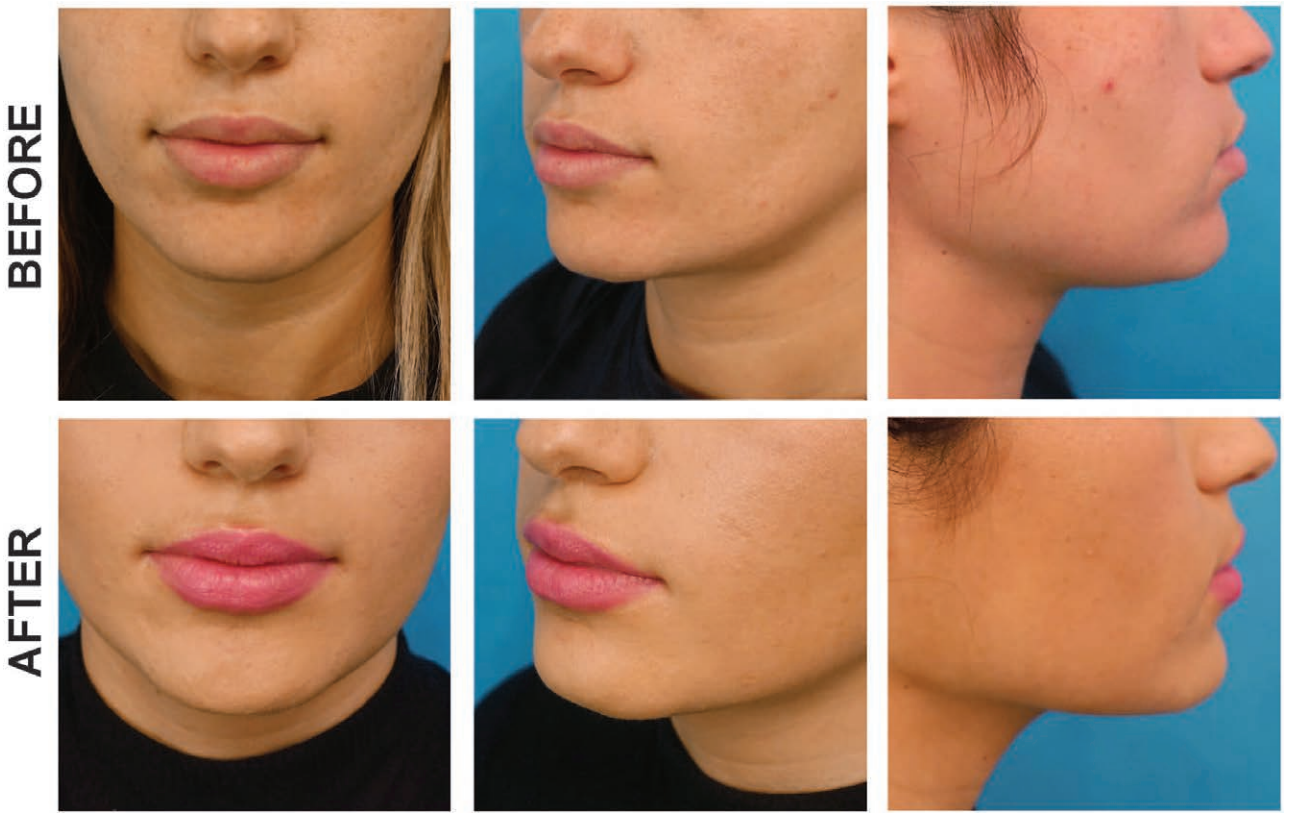

Fig. 1. Representative before/after treatment photographs of a 31-year-old patient with mild submental fat at baseline who received one 8-mL treatment of ATX-101. Time between before and after photographs was 2 months, 5 days. Photos courtesy of Sachin M. Shridharani, MD.

because of a lower amount of remaining SMF.[24] Although no formal study thus far has investigated peak severity, based on clinician observations, swelling tends to be greatest the day after treatment administration, with substantial swelling for the next three days. Photographs and/or videos showing what patients can expect in terms of swelling/edema over time can be helpful (see Fig. 3). Pre- and post-treatment comfort measures can minimize edema/swelling as well as associated pain (Table 2).[14,25] Postapproval experience and feedback from clinicians suggest that topical numbing may not provide any additional alleviation of discomfort than the use of ice, because the discomfort felt by patients may be less related to the actual needle than a burning sensation following the injection.

Downtime following ATX-101 treatment should be reviewed with the patient during the initial consultation. Only 13.3% of patients missed work, while 33.9% missed social/leisure activities during the seven days after initial treatment in a phase 3b trial.[19] Following subsequent treatments, only 2.4%–6.0% of patients missed work, whereas 10.0%–15.7% missed social/leisure activities.

MANAGING EXPECTATIONS OF OTHER AES ASSOCIATED WITH ATX-101

Knowledge about any potential AEs is important for informed consent and setting patient expectations, but it should be presented realistically with reference to published data and physician experience so as not to introduce an unnecessary barrier to ATX-101 treatment. Cases of MMN injury, manifested as an asymmetric smile or facial muscle weakness (paresis), were reported during the REFINE trials (pooled results: ATX-101, 4.3%; placebo, 0.4%),[12–14] and all resolved spontaneously (range: 1–298 days, median: 44 days).[7] In our experience, temporary MMN injury occurs at a much lower rate in clinical practice than in the REFINE trials, with an incidence of 0.2% among ATX-101–treated patients in the CONTOUR trial.[16] Patient and physician concern about MMN injury may unnecessarily limit the treatment area [which is from the anterior border of the sternocleidomastoid muscle (SCM) to the anterior border of the contralateral SCM[21]] and result in poor outcomes. Several cases attributed to MMN were likely pseudo-MMN, as has been described and proposed as direct injury or inflammation of the platysma, which could cause injury and dysfunction to the muscle.[26] To distinguish between naturally occurring smile asymmetry and that from MMN following ATX-101 treatment, baseline photography is important. Nevertheless, our experience is that patients who experienced MMN paresis continued with ATX-101 treatment.

Dysphagia reported in the REFINE trials (1.9%) was likely due to swelling/edema and induration within the submental area.[12–14] The dysphagia cases spontaneously resolved (range: 1–81 days, median: 3 days).[22] Dysphagia is infrequently observed in clinical practice; its incidence among ATX-101–treated patients in CONTOUR was

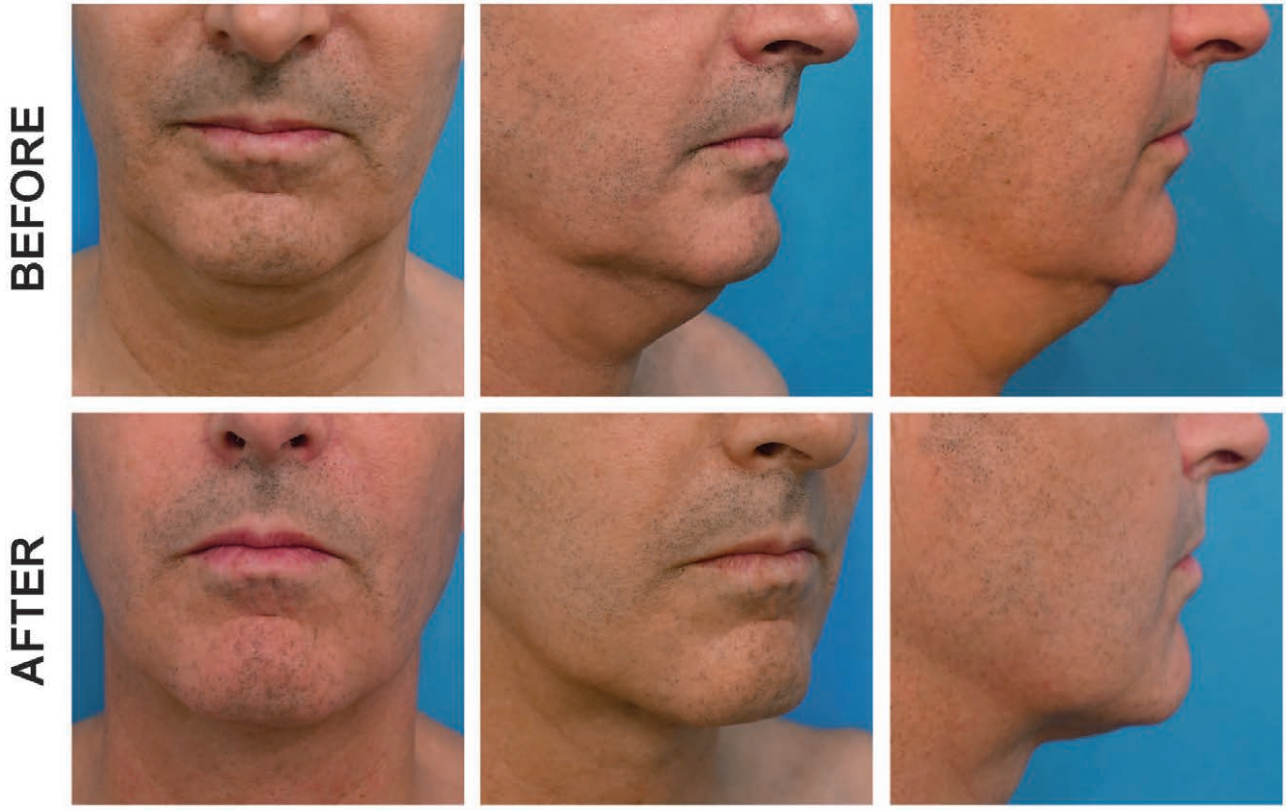

Fig. 2. Representative before and after treatment photographs of a 58-year-old patient with moderate submental fat at baseline who received two ATX-101 treatments (total combined volume, 20 mL). Time between last treatment and after photograph was 3 months, 13 days. Photos courtesy of Sachin M. Shridharani, MD.

0.2%.[16] We advise on clearly defining dysphagia to patients to mitigate any fears and concerns.

Mild and moderate injection site alopecia was also reported in the REFINE trials (0.4%, median duration: 151 days),[14] with similar incidence rates in CONTOUR (0.2%).[16] A single-center observational study (N = 100) with a 2-year analysis found that nine of 39 men experienced transient alopecia (duration: 6 weeks–12 months).[21] Male patients with beards should be made aware of potential alopecia, which is most often temporary but can persist in rare cases.

GUIDANCE FOR ADMINISTRATION OF ATX-101

Physicians should tailor the number of injections at each treatment based on the SMF severity, including its distribution and thickness, and treatment goals of the patient. An area-adjusted dose of 2 mg/cm^2 ATX-101 is injected into preplatysmal subcutaneous fat tissue in the submental area with a standard 0.5-inch needle. A single treatment consists of up to 50 injections of 0.2 mL each (up to a total volume of 10 mL), spaced 1 cm apart.[7] In the REFINE trials, mean volume of ATX-101 per treatment

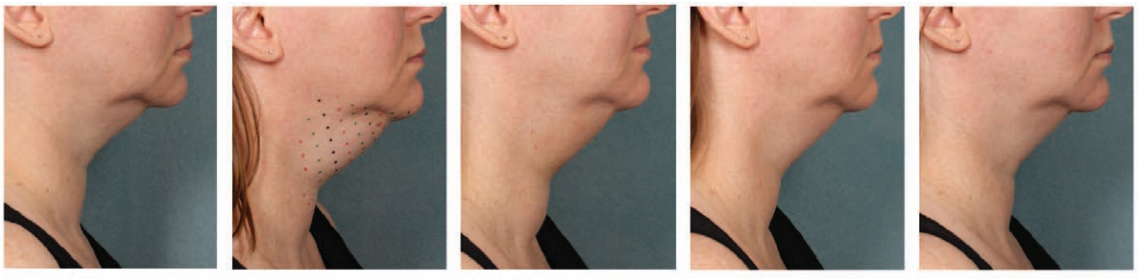

Fig. 3. Representative photographs of typical swelling 1 day, 1 week, and 4 weeks after ATX-101 treatment. At baseline, patient was 43 years old, weighed 149.2 lb, and had a body mass index of 25.6 kg/m^2.

Table 2. Recommended Pre- and Post-treatment Measures to Minimize Edema/Swelling and Pain

Pre-treatment
• Acetaminophen or ibuprofen
• Ice
• Lidocaine injection*
Post-treatment (for the 48 hours following treatment)
• Ice (liberal use)
• Sleep with head of bed elevated
• Minimize salty foods
• Limit alcohol consumption
• Avoid exercise
• Compression (may help some patients)

*Note that in our experience, topical anesthetic has limited impact and interferes with the marking grid used to guide the injection.

was 5.4 mL but declined with subsequent treatment sessions.[14] In the CONTOUR trial, the mean volume administered per treatment ranged from 3.2 mL to 3.5 mL and remained relatively stable over subsequent treatments.[14,15]

To ensure the safe and effective use of ATX-101, physicians must understand the relevant submental anatomy, associated neuromuscular structures, and any alterations to anatomy due to prior surgical or aesthetic procedures.[7] Proper injection technique to reduce the risk of AEs, such as MMN injury, includes palpating the submental area before ATX-101 injection to ensure the presence of sufficient subcutaneous fat between the dermis and platysma. This preplatysmal fat ("pinchable fat") is identified as the target ATX-101 treatment area.[7] Injecting ATX-101 midway into the preplatysmal fat avoids injection into the neighboring structures, such as the dermis, salivary glands/ducts, lymph nodes, and muscles (eg, platysma, digastric). Injections that are too superficial may result in skin ulceration/necrosis around the injection site,[7] whereas injecting too deep will miss the target area, potentially injure the platysma, cause pseudo-MMN symptoms, and will likely result in rapid denaturation of the ATX-101 by the platysma due to the high protein content of the muscle. To reduce the risk of MMN injury, it is advised to not inject above a line drawn 1.0–1.5 cm below the inferior border of the mandible from the gonion to the mentum.[7]

While being mindful of the risk of AEs, care should be taken to avoid under-dosing of ATX-101. Injecting ATX-101 from the anterior border to the contralateral anterior border of the SCM is reasonable and appropriate in the presence of subcutaneous fat lateral to the submental area.[21] Increased awareness of the lower rate of MMN injury in real-world clinical practice relative to the ATX-101 clinical trials could help broaden this practice. Our experience suggests that using the highest appropriate dose at the time of first injection leads to better results and improved patient compliance. Trying to ease the patient into treatment with lower initial doses will lead to patient dissatisfaction with treatment. In addition, the amount (surface area) of SMF should primarily determine the treatment volume given to each patient to prevent underdosing and subsequent suboptimal outcomes. The convexity/thickness of the SMF should not determine injection volume, but rather should serve as a guide for the number of ATX-101 treatments required. In clinical practice, the patient's desire to limit costs may lead to fewer ATX-101 injections (volume) and/or treatments, contributing to suboptimal outcomes. In our experience, pricing ATX-101 as an outcomes-based therapy (versus per vial) helps set patient expectations on the cost to achieve optimal outcomes.

To ensure that an adequate treatment volume is given and spaced appropriately, the planned treatment area should be marked with a surgical pen and a 1-cm injection grid applied (Fig. 4).[7] It may not be necessary to inject every mark on the grid; rather, the amount (surface area) of SMF and the grid can define and guide the ATX-101 injection area. For best results, physicians should avoid "feathering," which is injecting volumes less than 0.2 mL around the edges of the defined treatment area.

ATX-101 treatments should be spaced a minimum of 4 weeks apart.[22] In our collective experience, treatment intervals range from 6–8 weeks. In CONTOUR, the ATX-101 treatment interval ranged from 9–17 weeks[15] to allow sufficient time for resolution of the inflammatory response and remodeling of the treatment area. The ATX-101 treatment effect continues beyond the 4-week interval followed in the REFINE trials; the percentage of patients who achieved a one-grade improvement or greater in SMF following a single ATX-101 treatment increased from 14.1% at 4 weeks to 47.0% at 12 weeks in a phase 3b clinical trial.[22]

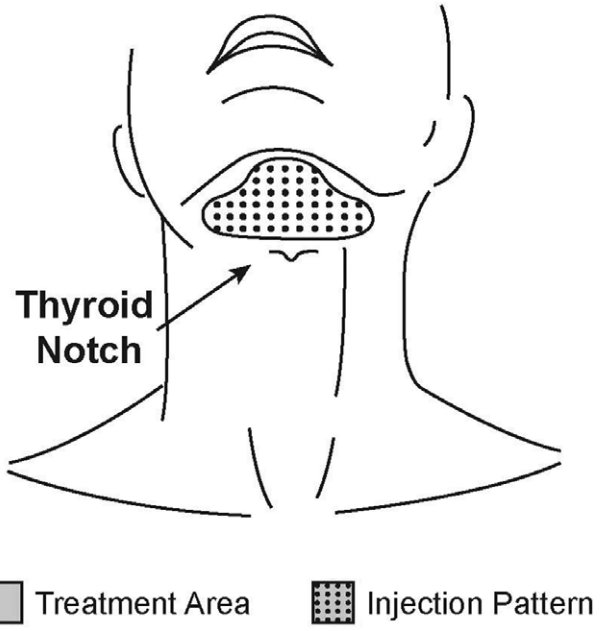

Fig. 4. ATX-101 treatment area and injection pattern, as shown in the Kybella (deoxycholic acid) injection prescribing information. Available at https://www.accessdata.fda.gov/drugsatfda_docs/label/2020/206333s002s003lbl.pdf. Kybella [package insert]. Irvine, Calif.: Allergan Sales, LLC. 2015. Used with permission.[8]

COMBINATION THERAPY FOR SUBMENTAL CONTOURING

Physicians should assess the entire lower face (jawline, submental area, neck) to recommend the most appropriate treatment(s) for each patient to achieve optimal submental contouring or lower face rejuvenation. In clinical practice, ATX-101 treatment may be administered in combination with botulinum toxins, hyaluronic acid fillers, radiofrequency treatment, and cryolipolysis (CoolMini; CoolMini Applicator, CoolSculpting System; ZELTIQ Aesthetics). For example, if the patient has extreme SMF, the CoolSculpting CoolMini applicator may be used to debulk the area, and ATX-101 can be used for subsequent fine contouring of the submental area. In the right patient, this combination treatment can result in outstanding patient outcomes.

The improved definition and skin retraction resulting from reduced fat may decrease the need for dermal fillers in the jawline or chin, as well as the need for additional skin-tightening treatments. However, additional aesthetic treatments can still be performed at later visits to further improve the appearance and jawline contour. Most physicians prefer to treat with neuromodulators at later visits to ensure that platysmal bands have not been skeletonized and that potential postprocedure swelling does not mask the benefits of botulinum toxin treatment. Same-day combination treatment with other aesthetic injectables is acceptable, provided the treatment areas are not overlapping or close to the area of ATX-101 injections, to manage any cumulative increase in swelling or other AEs. Skin redraping using sutures/threads can be performed no earlier than 3 months after final ATX-101 treatment. If skin redraping is initially performed, we recommend waiting at least 4 months before ATX-101 treatment. Additional surgery of the head and neck in the treated area can also be done after 4 to 6 months to allow inflammation to subside.

CONCLUSIONS

ATX-101 is a minimally invasive and highly customizable injectable treatment for SMF reduction. Careful patient selection, realistic patient expectations, and administration guidance are key to ensuring optimal outcomes, as well as mitigating the risk of AEs and poor compliance. Real-world experience indicates that the risk of MMN injury is lower than originally anticipated. Packaging ATX-101 treatments as outcome-based treatments may improve compliance with the multiple treatment cycles required for optimal results. Following the approval of ATX-101 for SMF reduction, successful off-label use of ATX-101 has been reported for reduction of excess subcutaneous fat in other areas such as jowl fat[18,27,28] and bra (peri- and post-axillary) fat.[29] The clinical practices outlined in this article will help physicians improve the treatment experience of patients seeking to address their SMF and rejuvenate their lower face.

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