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BEYOND THE DOUBLE-CHIN: THE USE OF DEOXYCHOLIC ACID FOR NON-SUBMENTAL FAT REDUCTION

Deoxycholic acid is a secondary bile acid that aids in the emulsification of fat for absorption in the intestine. In 2015, Health Canada approved non-animal, non-human, synthetically derived deoxycholic acid (DCA injection: ATX-101; KYBELLA, Madison, New Jersey; BELKYRA, Canada and Sweden; KYTHERA Biopharmaceuticals, Inc., Westlake Village, CA, acquired by Allergan, Inc.) for the treatment of moderate-to-severe submental fat. Available in a 2 mL vial of 10 mg/mL solution, deoxycholic acid is injected into affected areas at 0.2cc per cm. Deoxycholic acid causes adipocytolysis one to three days after being injected directly into adipose tissue by irreversibly disrupting the adipocyte cell membrane. One week after injection, macrophages are recruited to the area, and by day 28 fibroblasts and evidence of neocollagenesis can be seen, resulting in lasting fat reduction within the treated area.[1,2]

Clinical trials have demonstrated the safety and efficacy of deoxycholic acid injection into submental adipose tissue.[3-7] Previous treatment options for this area included liposuction and cryolipolysis, and as the sole injectable agent approved for lipolysis, deoxycholic acid has filled a void in treatment for the 'double chin' that many patients experience. In a 2021 consumer survey, the American Society for Dermatologic Surgery found that 70% of respondents were bothered by excess fat under the chin/neck, while 77% were bothered by excess fat on any part of the body.[8]

Following its approval for submental fat reduction, there has been an interest in the use of deoxycholic acid for reduction of fat in other areas. A number of researchers have investigated the effects of injectable deoxycholic acid for both medical and cosmetic indications, including summaries and systematic reviews of alternative applications of deoxycholic acid.[9-12] The following article summarizes the available literature on the use of deoxycholic acid in other body sites.

For jowl reduction:

Jowl formation occurs due to hypertrophy and descent of the mandibular septum and

submandibular superficial fat compartments. These changes are associated with loss of definition to the jawline, and patients often seek treatment to minimize jowl fullness and restore jawline definition. Deoxycholic acid can be injected to minimize the jowls, either alone or in combination with other cosmetic treatments. Jowls can be treated with deoxycholic acid in isolation, or at the same time as the submental fat. In studies, patients were injected with between 0.4 and 1 mL of deoxycholic acid per jowl per treatment, ranging from one to three treatment sessions.[13-16] In all studies, patients demonstrated improvement in jowl appearance. Common adverse effects included induration, bruising, pain, redness and edema. More significant adverse events include dysphagia,[14] injection site alopecia[13] and marginal mandibular nerve paresis,[13,15] all which resolved spontaneously and without sequelae.

For reduction of anterior/posterior periaxillary fat:

Anterior periaxillary fat is an ideal body site for treatment with deoxycholic acid as the quality of fat in this area is similar to that in the submental region, and the area lacks major vascular and neurologic structures.[17] A retrospective chart review of 12 women treated in this area showed that patients received 1-2 treatments with a total volume of 13.9 +/- 8.4 mL of deoxycholic acid injected. Ten of the 12 patients showed a reduction in anterior axillary fat following treatment. Numbness, edema and tenderness were common adverse events, with one patient reporting transient induration.[17,10] It should be noted that fat necrosis in this area could pose a possible risk in causing abnormal mammography. While this has not been documented in the literature, further research in this area would clarify the theoretical risk.[18]

Posterior periaxillary fat is more difficult to treat successfully than anterior, as the area has fat that is more fibrous in nature and can require higher volumes of product.[10] A study of 5 patients each receiving 3 treatments of 2 mL of deoxycholic acid at four week intervals showed a 17% reduction from baseline. Adverse events included minor pain, edema and bruising.[18]

For treatment of paradoxical adipose hyperplasia secondary to cryolipolysis:

Paradoxical adipose hyperplasia (PAH) manifests when patients who undergo treatment with cryolipolysis subsequently develop well demarcated masses of adipocytes, fibrosis and scar tissue to the treated area. The literature describes a single case of a patient who experienced PAH of the lower abdomen following two cycles of cryolipolysis. The patient was treated with three sessions of deoxycholic acid, with a total of 4 mL per session and significant improvement in lower abdominal fullness which was maintained to follow up at 5 months post treatment was noted.[19]

For reduction of brassiere line fat:

In another published case series, two female patients were treated with deoxycholic acid for bra-line lipolysis. The patients received 2-4 mL in one single session. They experienced pain and mild swelling and both noted a decrease in bra-line adiposity.[20]

For reduction of lower eyelid fat pad:

Infraorbital fat pad herniation is a common cosmetic concern with few non-invasive treatment options. The literature describes the use of deoxcycholic acid in two patients with infraorbital fullness due to fat pad herniation, in which 0.1cc of deoxycholic acid 10 mg/mL was used in a single injection to the central infraorbital fat pad over three separate treatment sessions. The patients experienced edema and bruising, but there were no ocular adverse events. Patients were satisfied with the outcome of the treatment.[21]

A study from 2019 reported results from 120 patients treated with 0.05 to 0.15 mL of 1.25% deoxycholic acid to each lower eyelid fat pad. There were no significant adverse events, though six patients did experience transient conjunctivitis. Therapeutic success was achieved in 85.83% of patients, and the greatest improvement was noted to occur in patients <40 years of age.[22]

For reduction of abdominal fat:

A prospective, longitudinal, non-randomized study examined the use of deoxycholic acid in hypogastric fat reduction. Fourteen patients were treated in four quadrants of the lower abdomen. Most patients received four treatment sessions, and the mean total volume used per patient was 26.6 mL. Adverse events included edema, bruising and erythema, and no significant adverse events were reported. While fat thickness was reduced, it was not statistically significant in all four quadrants. Fifty-eight percent of patients were satisfied or very satisfied with the outcome, and 42% remained neutral or dissatisfied. The authors hypothesize that patients may have been unsatisfied due to the inability of deoxycholic acid at the volumes injected to impact the deeper layers of

abdominal fat. The authors concluded that for the abdomen, deoxycholic acid is best reserved for small areas and more localized fat deposits, as treatment of larger areas may not provide satisfactory results and may be cost prohibitive.[23]

For reduction of inferior buttocks fat:

Infragluteal fat (otherwise known as the banana roll) can be treated with deoxycholic acid. Use in this area is anecdotal and is not well-defined in the literature. Some case reports suggest that 6-8 mL of deoxycholic acid per side can be used for each treatment with success.[10]

For reduction of superior knee fat:

The suprapatellar fat pad can be treated with deoxycholic acid when the fat in this area is well localized rather than diffuse. As with treatment in the buttocks, use in this area has only been reported anecdotally and typically 6-8 mL of deoxycholic acid can be used per side for each treatment.[10]

For reduction of fat in other areas:

A single observational prospective study in 2018 examined the use of a solution of sodium deoxycholate 1.25% administered as intralipotherapy to the buffalo hump, pseudogynecomastia, back rolls, flanks, arm, abdomen, saddle-bag thighs, inner thighs and inner knee. Two hundred and twenty one patients were treated at six week intervals until the desired result was obtained, to a maximum of five sessions. A total of 10 mL of solution was used for each 10 x 10 cm body area. The treatment was delivered using a 23 g and 10 cm long needle using a retrograde fanning technique. Of note, in this study the solution used, amount of product injected, and method of delivery differs from the Health Canada approved deoxycholic acid formulation. The study found that the areas with greatest improvement were the flanks, abdomen and inner knee. The areas with the least improvement were the inner thigh and arm. Minor adverse events included swelling, pain, bruising, numbness, erythema and nodules lasting less than one month. Major adverse events included edema lasting more than 72 hours (2.1%), nodules lasting longer than one month (0.9%), skin changes (0.5%), and skin necrosis (0.01%).[24]

The use of deoxycholic acid in dermatologic conditions:

While the majority of studies have investigated the use of deoxycholic acid for the cosmetic reduction of unwanted fat, there is the potential for its use in a variety of dermatologic conditions as well. Reports in the literature include the use of deoxycholic acid for the treatment of lipomas[25,26] and the tender lipomas associated with adiposis dolorasa[27](Wipf), xanthelasma,[28] the fibrofatty tissue associated with infantile hemangiomas once they have involuted,[29] piezogenic pedal papules[30] and HIV associated lipohypertrophy of the buccal fat.[31] While the evidence is restricted to case series and case reports, deoxycholic acid may be a promising non-surgical option for conditions where surgical removal is contraindicated or not favourable due to the risk of scarring.

The above studies show that there is vast potential for the use of deoxycholic acid beyond the submental area, however, data in other body sites is very limited. Further studies, especially in the use of deoxycholic acid for dermatologic conditions, are needed to better characterize the efficacy and safety of this treatment. While deoxycholic acid may prove to be an acceptable alternative to the other options available for fat reduction, the high cost of treatment may be a limiting factor to widespread use, especially in larger body areas.

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