

Fat-Reducing Injections: Efficacy, Safety and Updated Scientific Evidence

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Abstract: Reducing injections are non-surgical procedures used to eliminate localized fat through three main approaches: adipolysis, enzymatic lipolysis, and mesotherapy. Although they have gained popularity as aesthetic alternatives, only adipolysis (deoxycholic acid) has demonstrated limited safety and efficacy in submental fat reduction. In contrast, enzymatic lipolysis and mesotherapy yield clinically insignificant results and carry a high-risk profile. Reported complications include fat or skin necrosis, infections, fibrosis formation, cutaneous irregularities, and severe—occasionally fatal—adverse events. In comparison to diet and exercise, these techniques represent a minimally effective and potentially hazardous alternative.

Keywords: adipolysis, lipolysis, mesotherapy, deoxycholic acid.

1. INTRODUCTION

The pursuit of rapid, non-invasive methods for body fat reduction has led to the rise of aesthetic treatments such as fat-reducing injections, which aim to eliminate localized fat through superficial microinjections (≈ 4 mm). These interventions encompass three main techniques: (1) Adipolysis, which destroys adipocytes using deoxycholic acid; (2) Enzymatic lipolysis, which activates local metabolism without causing cell lysis; and (3) Mesotherapy, which involves the injection of variable compounds (vitamins, pharmaceuticals, plant extracts).

Although these techniques gained popularity prior to rigorous clinical evaluations, in 2007 the U.S. Food and Drug Administration (FDA) began requiring evidence of safety and efficacy. As a result, none of these methods—except adipolysis with Kybella—received approval beyond restricted indications. This review updates the most recent scientific evidence, assesses associated risks, and provides evidence-based recommendations.

2. DISCUSSION

2.1. Adipolysis

Adipolysis involves the use of deoxycholic acid, a bile salt detergent that induces adipocyte destruction through necrosis. In 2015, the U.S. Food and Drug Administration (FDA) approved the use of synthetic deoxycholic acid exclusively

for the treatment of submental (double chin) fat in adults, under the brand name *Kybella*, following clinical trials that demonstrated efficacy using validated scales and a significantly higher response rate compared to placebo.

Among the most recent studies, a systematic review published in 2020 reported a significant reduction in localized fat with mostly transient and localized adverse events (1). A 2021 meta-analysis (2) showed a significant reduction in submental fat volume in over 90% of cases, with only mild and transient side effects. Another study reported an average reduction of 2.2 cm in the inner thigh region without severe adverse events (3). Potential complications of adipolysis include pain, fibrosis, localized alopecia, cutaneous necrosis, vascular injury, ulceration, and nerve damage due to improper injection. This technique should not be applied to areas with postsurgical fibrosis or poor circulation.

2.2. Enzymatic Lipolysis

This method employs a compound known as Lipo 102, a combination of salmeterol xinafoate (a β_2 -agonist) and fluticasone propionate (a glucocorticoid), originally formulated for patients with chronic obstructive pulmonary disease (COPD). Its current off-label use aims to stimulate the breakdown of triacylglycerols without causing adipocyte lysis. The most recent studies, dated between 2010 and 2015, reported waist circumference reductions of 1.5 to 3 cm

after eight weeks of treatment (4, 5). However, in the absence of appropriate dietary control and regular physical activity, the released lipids tend to be reused by the body, thereby negating the effect. To date, no robust clinical trials or published meta-analyses support the safety and efficacy of this compound. Its use remains experimental and is professionally discouraged for the management of localized fat.

2.3. Mesotherapy

Originally developed in the 1950s for chronic pain management, mesotherapy is now used for aesthetic purposes through microinjections of mixed substances that may include vitamins, minerals, amino acids, carnitine, silicon, plant extracts, hormones, or detergents such as deoxycholic acid or phosphatidylcholine—primarily aimed at reducing abdominal fat.

Tabla 1. *Comparativo general de métodos de inyecciones reductoras*

Método	Sustancia	Mecanismo de acción	Aprobación oficial	Evidencia de eficacia	Riesgos principales
Adipolysis	Deoxycholic Acid	Cell necrosis	Submental only (FDA)	Moderate	Necrosis, fibrosis, ulcerations
Enzymatic lipolysis	beta-agonist and glucocorticoid	Lipolysis without cell destruction	No	Very low	Reversible effect, inflammation, rebound
Mesotherapy	Various cocktails	Unknown/empirical	No	Null	Infections, necrosis, severe injuries

Tabla 2. *Factores que aumentan el riesgo de complicaciones por inyecciones reductoras*

Factor de riesgo	Consecuencia esperada
Apply >1 mL per area	Increased necrosis or fibrosis
Less than 1 month between sessions	Inhibition of tissue repair
Repeated injections in the same area	Vascular damage or local necrosis
Uneven depth between stakes	Skin irregularities, fibrosis
Post-treatment compression garments	Impaired lymphatic drainage
Pregnancy, diabetes, cardiovascular disease	High systemic risk

2.4. Riesgos Generales Y Precauciones

All methods carry the risk of bruising, swelling, irregularities, fibrosis, skin or muscle loss, and necrosis, particularly when administered in areas with poor microcirculation (e.g., extremities, previously operated or liposuctioned areas).

Risks are increased under the following conditions: administration of more than 1 mL per site, treatment intervals of less than a month, repeated injections at the same location or at varying depths, use of tight clothing after sessions, pregnancy, diabetes, and cardiovascular disease (Table 2). In all cases, the risk is significantly higher when the procedure is performed by non-medical personnel such as aestheticians or cosmetologists.

The most recent systematic review (2013) (6) concluded that available studies were limited in number, with small sample sizes, lacked FDA regulatory approval, and posed significant risks due to non-standardized techniques, adverse reactions, and infections.

More recently, attempts have been made to use mesotherapy for musculoskeletal disorders, but current evidence does not support its efficacy for such indications. On the contrary, it highlights potential adverse effects, including severe infections, skin necrosis, allergic reactions, cutaneous irregularities, and muscle injury (7).

Table 1 presents a comparative overview of the general characteristics of the three techniques.

3. CONCLUSION

Of the three techniques evaluated, only adipolysis with deoxycholic acid has demonstrated acceptable efficacy and safety in clinical trials for the treatment of submental fat; its use is restricted and requires administration by qualified medical professionals. In all cases, the risks far outweigh the potential benefits when compared to conventional methods such as diet and exercise, which provide more evenly distributed and sustainable results without the risk of localized adverse effects.

4. ETHICAL COMPLIANCE

The author states that she has no conflict of interest.

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