Oil injection for cosmetic enhancement of the upper extremities: a case report and review of literature

Andrea Sisti1, Maria T. Huayllani1, David J. Restrepo1, Daniel Boczar1, Oscar J. Manrique2, Peter N. Broer3, Shane A. Shapiro4, Antonio J. Forte1

1Division of Plastic Surgery, Mayo Clinic, Jacksonville, Florida, USA; 2Division of Plastic and Reconstructive Surgery, Mayo Clinic, Rochester, Minnesota, USA; 3Department of Plastic, Reconstructive, Hand and Burn Surgery, Bogenhausen Academic Hospital, Munich, Germany; 4Department of Orthopedic Surgery, Mayo Clinic, Jacksonville, Florida, USA

Summary. Here the authors report a case of complications occurred after injection of a site enhancement oil in the upper extremity for cosmetic muscles’ volume enhancement and a literature review on the topic. The medical and sports communities should be aware of the secondary effects of site enhancement oils use, which could bring to severe complications. (www.actabiomedica.it)

Key words: bodybuilding, injections, muscle, oil

Case Report

A 31-year-old man injected a material similar to silicone (Synthol) for cosmetic reasons into both biceps 4 years prior to presentation, and in the latter 2 years developed painful intermittent edema in both biceps that was uncomfortable and associated with heat and pressure (Figure 1). He denied any drainage in the past, but reported that every time he had infection episodes similar to this, he required antibiotic therapy. His past surgical history included lipoma resection on the right arm and abscess removal on the back in 2004. He smoked half a pack of cigarettes a day, but did not use alcohol. Upper limbs neurovascular and musculoskeletal examination was within normal limits with a normal range of motion. There were multiple areas of induration and cellulite on the bilateral arms along the biceps area.

We performed both magnetic resonance imaging and ultrasonography (Figures 2 and 3), which showed
infiltration of the biceps with injection material. The damaged tissues were surgically removed (Figure 4). Pathology examination showed foreign body giant cell reaction. No further adverse effects were reported prior to patient’s return to home country (Figure 5).
**Discussion**

*Cosmetic doping* is part of the more complex ongoing doping process in sports and among people desiring to look bigger and stronger (4). The injection of different substances for cosmetic reasons to increase muscles’ volume has been described since 1899 (3). SEOs were employed as solvents for anabolic steroids by the pharmaceutical industry previously, and started to be used alone by bodybuilders since 1996 (18).

It is thought that SEOs could increase muscular volume by causing muscle fiber hypertrophy and stimulating the appearing of new muscle fibers due to their irritant effect (18). Bodybuilders use these kinds of SEOs as a resource to improve the shape of muscles and to appear more cosmetically attractive as the muscle volume artificially increases. The increasing number of bodybuilders self-injecting oils validate a real concern about this practice (3). Despite immediate positive aesthetic results, several short- and long-term adverse effects to SEOs have been reported.

These adverse effects may occur months to years after injection cosmetic augmentation, and the incidence, though not known, is probably underestimated due to lack of information and literature on this topic.

Muscle-enhancement with damaging substances is a practice more frequent in men than in women, because traditionally men have been more involved in weight training exercises than women; in the past, muscle volume was thought to be an important cosmetic feature for men, more than for women (19). The users of SEOs are typically older than 20 years, and this could be related to difficult access to SEOs and the costs they incur (17).

Different kinds of SEOs such as soy oil, paraffin oil, safflower oil, sesame oil, silicon, coconut oil, and purified long- and medium-chain emulsion, are injected in a pure form or mixed with anabolic steroids (Table 1) (5, 9). The most frequently injected SEO is paraffin oil. This type of SEO had been used earlier, between the years 1950 and 1960, with immediate good aesthetic results but resulted in complications of skin inflammation, edema, abscesses, and lymphangitis. Paraffin oil usually becomes a foreign body and can cause an acute or chronic reaction depending on the dose injected (6). These complications are related to the migration of destructive paraffin oil in the tissues (13).

Synthol oil is a material similar to silicone, considered a doping substance, but unlike others, it does not bring any real benefit to the body or increase athletic performance. It is made of 85% oil, 7.5% lidocaine, and 7.5% alcohol. Its function is to inflate the muscles by being injected directly into the site of desired enhancement (20). The human body is unable to assimilate synthol oil and, therefore, it remains in the muscles for a long time, eventually causing swelling. The muscle enhancement requires several injections until a satisfactory level of muscle size and thickening is reached. Synthol oil does not contain steroids.

Sesame oil is frequently used as a solvent (eg, in intramuscular gold injections for rheumatoid arthritis), and as an alternative to intramuscular injections of steroids (1, 7). Less frequently injected oils and silicone could cause different tissue reactions, such as pseudotumors, that could be confused with other lesions (5). SEOs might cause allergic reactions, such as myalgia and vasculitis, or painful subcutaneous nodules, consistent with paraffinoma or oleoma, and chronic foreign-body reactions to oily substances (3, 7, 14) Histopathology of oleoma, caused by an oily substance, consists in a chronic foreign body reaction.

![Figure 5. Postoperative photographs of the same patient, 5 weeks after surgery. A, Dorsal surface of the relaxed arm. B, Volar surface of the relaxed arm. C, Volar surface of the flexed arm. D, Dorsal surface of the flexed arm.](image-url)
Table 1. Studies describing the use of site enhancement oils

| Authors                        | Year | Location   | Age of injection | Sex, Age | Latent Phase | Clinical Appearance/ Symptoms                                                                 | Injected Substance/ Amount       | Treatment                                      | Outcome                                        |
|-------------------------------|------|------------|------------------|----------|--------------|----------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------|-----------------------------------------------|
| Munch and Hvolris (16)        | 2001 | Denmark    | 26               | M, 26    | 3 weeks      | Swelling and tenderness overlying an injection site                                            | Walnut oil 3x10 mL              | Penicillin                                    | Lost to follow-up                              |
| Di Benedetto, et al (6)       | 2002 | Italy      | 32               | M, mean age=45 years, 7 patients | 13 years (mean duration of latent phase) | Extended lipogranulomas, fistulas, hardness of the skin, inflammation, discontinuation of the skin, secretion of oily materials, limitation of flexion and extension | Paraffin oil Amount NR | Wound débridement was performed emergently, with a ligature of the bleeding vessels. A wider débridement of the lesion was performed 10 weeks later because of recurrent fistulas, with the opening of the elbow joint capsule on its posterior aspect. A wide thoracoabdominal flap from the right side was harvested | After 10 weeks, 1 patient had deep fistulas and required a second wider débridement. NR in 6 patients. |
| Georgieva, et al (7)          | 2003 | Germany    | 42               | M, 44    | 2 years      | Multiple painful subcutaneous nodules on the upper arms                                         | Sesame oil 120 mL               | NR                                            | NR                                            |
| Koopman, et al (14)           | 2005 | Netherlands| 21               | M, 21    | 1 week       | A severe case of myalgia and purpura. Approximately 10 blue, itchy lesions with a maximum size of 36 cm² on the shoulders, arms, and legs were discovered | Sesame oil 10 mL                | Oral corticosteroids for 2 weeks and high-dose morphine injections to control pain | After 4 weeks, recovery was complete          |

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Table 1 (continued). Studies describing the use of site enhancement oils

| Study (Reference) | Year  | Country | Age, Duration | Symptoms Described                                                                 | Treatment | Outcome |
|-------------------|-------|---------|---------------|-----------------------------------------------------------------------------------|-----------|---------|
| Iversen, et al (13) | 2009  | Denmark | 21, M, 23, 1.5 years | Ulcers, pain, malaise, and fever. Skin red, swollen, and indurated. Enlarged painless lymphatic nodes in the neck | Paraffin oil 20 mL, Dicloxacillin and compression bandage from wrists to shoulders | A positive result from treatment. However, several sore firm masses on both arms developed. |
| Henriksen, et al (10) | 2010  | Denmark | 24, M, 24, 1 month | Skin inflammation, hard edema, sterile abscesses, diffuse lymphangitis, and paraffinomas | Paraffin oil 1 L in each arm, Compression bandages and antibiotics | Long-term adverse effects, including edema due to lymphatic decomposition and varying degrees of paraffinomas that migrated lymphatic and along fascia |
| Banke, et al (1) | 2012  | Germany | 32, M, 40, 8 years | Systemic infection and painful, reddened swellings of the right upper arm | Sterilized sesame seed oil Amount NR | Surgery Persistent pain and inability to perform normal weight training were evident for at least 3 years post-surgery |
| Maatouk, et al (15) | 2012  | France  | 22, M, 25, 3 years | Abscess, redness of the skin, pain, inflammation | Synthol oil Amount NR | Amoxicillin Cured |
| Ghandourah, et al (8) | 2012  | Germany | 24, M, 29, 5 years | Painful pressure in right upper arm. On presentation, muscle appeared disfigured | Synthol oil 3 mL x 16 injections, Open surgical excision of the anterior third of biceps was carried out through an anterior bicipital approach | Two weeks postoperatively, the patient was satisfied with the outcome. No adverse effects after surgery were reported. After 6 months, the patient requested the same procedure to be done on left biceps. |
| AbdullGaffar (5) | 2014  | United Arab Emirates | 30, M, 32, 2 years | Hard, nontender lump | Silicon Amount NR | NR |

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Patient’s arms were rock solid and clearly de-formed. Years after the injec-
tions, the patient suffered from spontaneous ul-
cerations on both arms.

Conservative wound treat-
ment with antibiotics and
compression therapy for
the right arm.
The left arm needed surgi-
cal revision and negative
pressure wound therapy,
preparing the tissue for a
split skin graft.

Ikander, et al (12)
2015 Denmark 40? M, 45 Few years

Tachypnea, tachy-
cardia, fever, and
anemia subacute
(fat-embolism–
like syndrome)

Mineral oil with added anabolic steroids
140 mL

Respiratory supportive care
and treatment with tranexamic acid, 1,000 mg
4 times daily, and prednisolone,
50 mg per day

At a clinical follow-up 3 months later, the patient
experienced only mild dyspnea on exertion. Chest
radiograph and CT showed complete remission of the bilateral
infiltrates

Hjort, et al (11)
2015 Denmark 35? M, 40 Several years

Muscles, fascia, and surrounding subcutaneous fat tissue
appeared inflamed and edematous

Site enhancement oil (not specified)
Amount NR

NR

Petersen, et al (17)
2015 Denmark NR M, 42 NR

Right arm pain and loss of function. Complete triceps rupture and multiple cystic areas within the muscles of the arm

Coconut oil
Amount NR

Right triceps tendon repair at its distal insertion with allograft augmentation

Cured

Hameed, et al (9)
2016 United Kingdom NR M, 25 NR

Inflammation, muscle atrophy, formation of oil-containing granulomas, hypercalcemia, and renal insufficiency

Site enhancement oil (not specified)
Amount NR

NR

Dejanovic and Loft (2)
2017 Denmark NR M, 50 NR

Inflammation, muscle atrophy, formation of oil-containing granulomas, hypercalcemia, and renal insufficiency

NR

NR

Abbreviations: CT, computed tomography; M, male; NR, not reported.
called *Swiss cheese pattern* with macrophages and fibrous tissue (7, 13).

It has been described that inflammation is the first sign of foreign-body reaction that appears, usually 1 to 6 months after injection. After a period of latency, ulcerations and fistulas develop in the superficial plane, but oil diffusion to deeper planes, such as the reticular dermis, may lead to lipogranulomas, which are oleoma formations in perivascular fat and perimuscular fat that cause replacement of the subcutaneous fat with oil dispersed within fibrous tissue (6, 10).

Magnetic resonance imaging is the preferred imaging study that is commonly used to confirm the diagnosis and resolution of the adverse effects, especially when lipogranulomatosis occurs (18). However, ultrasound could be useful to determine the presence of the fluid inside the lesion.

Several complications after the use of SEOs can appear over time, like granulomatous lesions, ulcerations, disfigurement, erratic migration of the oil, pulmonary embolism, and death (Table 1) (3). Moreover, systemic reactions could occur over time in people who use SEOs. Hypercalcemia due to foreign-body reaction has been described in patients abusing SEOs (2, 21, 22). Systemic distribution has been reported to result in pulmonary adverse effects (16).

There is no specific treatment to remove oil from tissues; a treatment aim is to hold diffusion of the substance to stop the dissemination to deeper tissues and other nearby organs. The first therapy given to patients consists of antibiotics and steroids during the acute inflammation phase (16). Surgical treatment may be an effective treatment modality. In an acute phase of the disease, surgical excision of the damaged tissue might help to remove the excessive oil deposits and the affected areas when there is a suspicious of lipogranulomas (6, 18).

Nevertheless, conservative treatment should be considered when there is a widespread distribution of the oil (13). Iversen et al. described the use of compression bandages on ulcers caused by oil injections, suggesting the improvement in circulation and reduction of the edema due to the shorter distance between skin and capillaries (13). Compression therapy was also applied by Henriksen et al and Ikander et al. with good results (10, 12).

Additional aggressive surgical procedures should be avoided because of the risk of damaging nearby tissues, worsening chronic injuries, and predisposing to large scars (10). Therefore, in chronic stages, conservative surgical procedures might be performed evaluating the risks and benefits over the condition of the patient and the possibility to improve function and pain if any tissue was damaged (8, 9).

It is unclear if some of these substances are more harmful than others or have a different complication pattern or treatment strategy, and this is not known at this point given the relative dearth of information published on the topic.

**Conclusions**

The use of oils injections to muscles for cosmetic reasons is a dangerous practice. Medical and sports communities should be aware. The adverse effects associated with the injection of SEOs are not predictable, ranging from mild to life-threatening complications. Diagnosis and treatment should be performed early in order to prevent severe complications.

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