

# Delayed oleoma formation with injection of oil-suspended testosterone: A case report and review of pathogenesis

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## Abstract

This is the case report of a 51-year-old man who was seen in consult with plastic surgery presenting with painful, disfiguring, submuscular nodules in the bilateral deltoids and right gluteal regions. Pre-operative investigations confirmed the presence of multiple heterogeneous, complex non-vascular fluid collections in the subcutaneous and intramuscular layers. The origin of these lesions was unknown until the post-operative follow-up appointment where the patient revealed that he had injected those areas with testosterone suspended in oil 9 years prior. Later, pathology reports confirmed the presence of numerous granulomas containing yellow viscous fluid and focal areas of calcification consistent with the diagnosis of oleomas. This case presents an important differential in the diagnosis of subcutaneous nodules and a review of pathophysiology of granuloma formation, and highlights some of the complications of oil injection use by bodybuilders.

## Keywords

Surgery, granuloma, oil cyst, foreign body

## Case report

A 51-year-old man was seen in consult with plastic surgery with clinically suspected lipomas in the bilateral deltoid and right gluteal regions. The patient reported a 3-year history of masses in the bilateral deltoids and right gluteal regions. The resulting pain, disfigurement and growth of the masses prompted the referral to plastic surgery for excision. Prior to surgery, the origin of the lesions was unknown. It was not until the 1-week follow-up appointment where the patient revealed that he had received testosterone injections suspended in an oil-based solution of unknown origin 9 years prior in his deltoids and gluteal muscles during his preparation for a bodybuilding competition. At the time of injection, he did achieve the intended cosmetic result and did not experience pain over the injection sites. It was not until 6 years later until he began to experience symptoms.

Clinical examination performed upon initial consultation revealed smooth, non-tender and mobile submuscular masses measuring approximately 10 × 10 cm on the bilateral deltoids and right gluteal regions. The patient described a dull pain in the affected areas but denied any other symptoms such as bleeding, itching, drainage or any other skin manifestations. The patient is otherwise healthy, a non-smoker and takes Symbicort to treat his asthma. The ultrasound revealed bilateral unusual non-vascular, well-defined, complex cystic lesions in the deltoid muscles and right buttock

– inconsistent with the presentation of a lipoma. There was also evidence of thickened internal septations, along with heterogeneous, echogenous anterior wall thickening. Further imaging was performed using magnetic resonance imaging (MRI) which confirmed the presence of multiple intramuscular complex fluid collections or hematomas in the bilateral deltoids with similar findings in the right gluteus maximus muscle. With contrast, some peripheral septal enhancement was observed. All lesions were suspected to be of similar origin and primary or secondary malignancy was deemed unlikely given the distribution of the lesions.

The patient was placed under general anaesthetic and additional local anaesthetic block was injected in the surgical fields. Upon excision, multiple cysts of varying sizes, containing an oily substance, were found both subcutaneously and intrinsically to the bilateral deltoids and right gluteus maximus muscles (Figure 1). Complete excision of all cysts proved to be difficult due to the extent of muscular involvement, and therefore muscular preservation was preferred

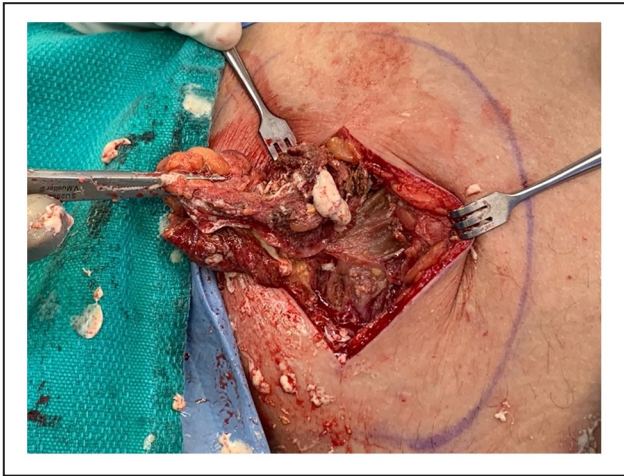
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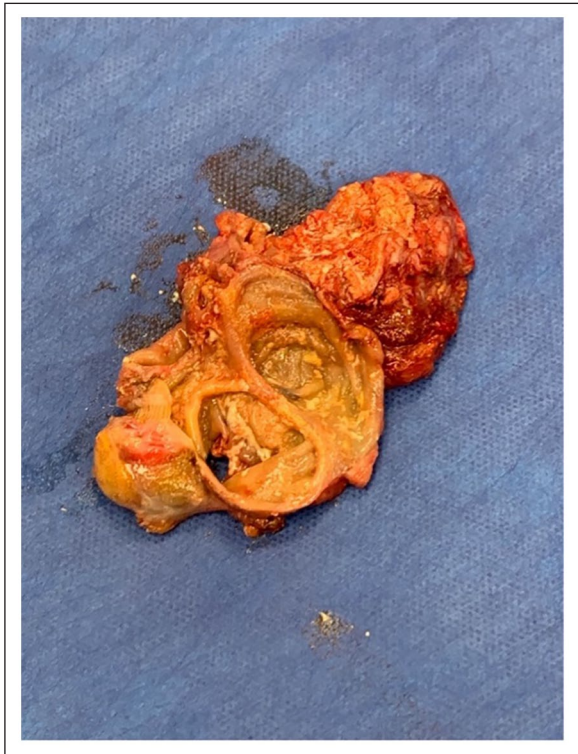
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**Figure 1.** Surgical field of the right gluteal region. Multiple, complicated cystic structures containing an oily yellow substance are found within the muscle.



**Figure 2.** Large cystic structure with septum.

over complete excision of the suspected benign cysts. This approach favoured a less painful and prolonged recovery while rehabilitating normal cosmesis.

Later, pathology reports confirmed the presence of numerous granulomas containing yellow viscous fluid with focal areas of calcification consistent with the diagnosis of oleoma, or oil cyst (Figure 2). All samples demonstrated extensive acellular deposits involving skeletal muscle and

fibroadipose tissue surrounded by a heavy giant cell reaction and focal calcifications. Focal areas of fat necrosis-like zones and cystic spaces were also noted.

Upon follow-up, the patient reported significant relief despite the limited excision of the granulomatous material and no further interventions were needed in the management of this patient's care.

## Discussion

Various mediums have been reported for use in cosmetic enhancement in the bodybuilding industry for years.<sup>1</sup> Substances such as anabolic steroids can be injected directly into musculature and may be suspended in oil, silicone or paraffin in order to increase the appearance of muscle bulk locally and aid in gradual release of lipophilic drugs.<sup>1,2</sup> Due to the often clandestine nature of these practices, it is difficult to gain a proper appreciation of the composition of the suspension liquid. Besides formation of granulomatous cysts, there have been reports of more severe complications such as hypercalcemia and necrosis at the site of injection using these suspension mediums.<sup>3,4</sup> Eldrup et al.<sup>3</sup> found that injecting large amounts of oil placed individuals at higher risk for abnormalities in calcium homeostasis, predisposing them to hypercalcemia and nephrolithiasis. Other side effects associated with intramuscular injection of oil include pain, infections, abscesses, chronic wounds, accidental intravenous injections leading to formation of emboli, long-term muscle atrophy and a decrease in muscular volume as well as local swelling and changes in lymph nodes.<sup>5</sup>

Foreign body granulomas can form with injection of various fillers, including oils and waxes used as suspension liquids for anabolic steroids.<sup>1</sup> The formation of granulomatous cysts occurs when neutrophils are unable to effectively phagocytose foreign particles, resulting in a macrophage-dominant response.<sup>6</sup> Following injection of a foreign substance, neutrophils rapidly invade the site of disruption, coating the foreign material with host proteins.<sup>6</sup> The presence of these proteins allows for attraction of monocytes to the site where they transform into macrophages.<sup>6</sup> The granulomas are composed mostly of activated macrophages that fuse to create multinucleated giant cells, which were found in the specimens sent for pathology of our patient.<sup>6</sup> The macrophages then secrete substances that activate fibroblasts, leading to the development of the fibrous capsule that composes the cyst. Foreign body granulomas may even occur 10–15 years after injection of a foreign body.<sup>6</sup> In addition, androgens are known to suppress adaptive immune responses and affect innate immune cells, such as monocytes, by causing an increased production of proinflammatory cytokines.<sup>7</sup> Increased production of proinflammatory cytokines due to exogenous testosterone administration, in combination with the unknown nature of the suspension liquid, may play an important role in the immunopathological mechanisms of granuloma formation.

### Declaration of conflicting interests

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### Informed consent

Informed consent was obtained from the patient for the information and images found in this report.

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