CASE REPORT

Muscle mania: the quest for the perfect body

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SUMMARY

We describe the case of a young man with repeated hospital presentations for a variety of symptoms related to excessive bodybuilding and associated behaviours. He presented to our department (radiology) with right arm pain and loss of function. Ultrasound showed complete triceps rupture, rare in young patients and multiple cystic areas within the muscles of the arm. MRI revealed these to be multiple proteinaceous lesions within the muscle bellies and the possibility of self-innoculation was raised by the reporting radiologist. The patient subsequently admitted to injecting coconut oil to improve muscle contour lost secondary to injury. A review of his hospital presentations was then made and revealed further concerning practices performed by the patient to enhance his muscular appearance.

BACKGROUND

The self-administration of anabolic steroids among bodybuilders for muscular augmentation is well known. However, other compounds may be used, including natural oils, with the rationale of generating a slowly degrading intramuscular depot to improve muscle size and/or contour. This is a little recognised practice globally with sparse documentation in the medical literature. However, it is well known among Arab and Middle Eastern communities and on internet sites. The long-term impact of this practice on the musculature itself, as well as potential adverse effects compromising health and sporting ability, lack thorough description.

We need to be aware of these cases to enable correct clinical diagnoses and also to recognise other self-abusive and potentially life-threatening practices which may be seen in conjunction.

CASE PRESENTATION

A man aged 25 years presenting with pain and reduced mobility of the right elbow for several months was referred to radiology for an ultrasound scan. He had taken up bodybuilding 4 years prior and attended the gym three times each week. His aim was to return to full gym activities. On clinical examination, there was a potential discontinuity of the triceps insertion at the right elbow.

The ultrasound scan revealed a ruptured triceps tendon and multiple poorly defined, avascular lesions within the muscle bellies of the arm (figure 1A–C). As the right arm was the only symptomatic area, no further regions were imaged. The patient was agitated and sweating profusely during the examination and infection was excluded in the first instance. He subsequently underwent MRI of the right arm. This confirmed triceps rupture and the lesions were suggested to represent either focal

haematomas or proteinaceous lesions (figure 2A–C). Furthermore, there was generalised high signal change present in the triceps and biceps muscle bellies (figure 2D). These findings raised self-innoculation as a viable possibility. This was discussed with the patient in orthopaedic clinic. He admitted to intramuscular self-inoculation of coconut oil. It was at this point that more concerning practices became apparent;

1. Non-prescribed use of rapid-acting insulin due to a perceived benefit to his physical fitness from growth promotion and decreasing body fat. This led to three tonic-clonic seizures and recurrent left shoulder dislocation with resultant advanced osteoarthritic change within the left glenohumeral joint and a significant reverse Hill-Sachs's lesion (figure 3A, B).
2. Non-prescribed use of liothyronine causing fluctuating thyroid function tests and suppression of endogenous sex and thyroid hormone production with long-term implications for fertility.
3. Self-administered intramuscular vitamin B₁₂ injections resulting in cellulitis and hospital admission for intravenous antibiotics.
4. Anabolic steroid use, including cyclical testosterone undecanoate depots, leading to surgery for gynaecomastia and liver haemangiomas.
5. Excessive use of protein supplements leading to glomerulonephritis.

INVESTIGATIONS

Initial blood tests demonstrated liver function abnormalities; ALT 131 (normal 10–50 IU/L), ALP 190 (normal 30–130 IU/L), GGT 90 (normal 10–71 IU/L) and bilirubin within normal limits.

During workup for theatre, transient disturbances in thyroid function tests alerted the medical team to synthetic thyroid hormone use. Thyroxine (free) 1.09 (normal 12–22 mmol/L), TSH 0.005 (normal 0.27–4.2 mIU/L).

Testosterone levels were recorded at >52 (normal 9.9–27.8), FSH <1 (normal 1.5–12.4) and LH <1 (normal 1.7–8.6).

TREATMENT

Our patient was listed for right triceps tendon repair at its distal insertion with allograft augmentation.

OUTCOME AND FOLLOW-UP

Following the operation, the surgical wound was noted to be healing well and a gentle course of physiotherapy was provided. However, despite being counselled about the potential future risks,

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Figure 1 Ultrasound images of the right upper limb (A) triceps tendon rupture; tendon insertion at the olecranon process (short arrow) and avulsed fragment with the distal triceps attached (long arrow). The centimetre increments at the top of the image show tendon retraction of ~5 cm. Fatty atrophy, oedema and cystic changes are also evident, (B) lateral triceps belly and (C) middle triceps belly illustrating fatty atrophy and multiple ill-defined, avascular, intramuscular lesions.

the patient continues to practice unsafe techniques to achieve his desired body image.

DISCUSSION

Site enhancement oils have been around since the 19th century with the aim of improving muscular size and/or contour for purely cosmetic purposes. Although now not used medically, natural oils are often less costly than other synthetic compounds and are therefore an attractive option, particularly to amateur bodybuilders. Despite its prevalence in the lay press, this phenomenon has minimal reporting in the medical literature. There are a few case reports of adverse effects after injections of sesame oil,¹⁻³ walnut oil⁴ and paraffin.^{5 6} However, there are

no reports in the literature that document the effects of chronic use of intramuscular coconut oil, and two reports of enhancement oil use in excess of 1 year.^{3 6}

Our case corroborates the radiological findings of intramuscular oil injection described to date; cystic areas of high-intensity signal and generalised high signal corresponding to inflammation secondary to foreign body presence.^{1 3 6} Local foreign body reactions are striking, with resulting tumours apparent within months of use.^{1 3 4 6} These are termed according to the inoculated material, that is, oleoma, paraffinoma and are due to granulomatous reactions to lipophilic material. If these abnormalities are identified, they should prompt a review of the clinical case for the above-mentioned practice, as

Figure 2 MRI of the right upper arm: (A) sagittal T1-weighted image demonstrating no intact fibres at the triceps insertion consistent with full-thickness rupture. (B) Coronal T1-weighted image and (C) coronal STIR image showing high signal lesions on MRI which correspond to the cystic changes seen on ultrasound. (D) Axial T2-weighted fat suppressed sequence showing generalised high signal change within the biceps muscle belly, which was also seen in the triceps, and may represent myositis.

Figure 3 (A) Plain anteroposterior radiograph of the left shoulder showing osteoarthritic changes at the glenohumeral joint. (B) Axial reformat CT scan of the glenohumeral joint reveals a large reverse Hill-Sachs lesion of the left anterior humeral head consistent with posterior shoulder dislocation.

was the situation for our patient. Other local reactions noted include skin ulceration and infection.³ Our report documents, for the first time, the ultrasound and MRI findings of intramuscular oil injection.

Alarming, this practice used for the short-term enhancement of muscular appearance seems to come at a significant cost. There is a risk of long-term muscle fibrosis, deformity and irreversible loss of function. In the only study to include such imaging, a follow-up MRI failed to show muscle regeneration.³

There is also the potential for more acute reactions; one group reported histologically confirmed panvasculitis within 1 week of sesame oil injection which presented as severe myalgia and purpura.² Other extra-musculoskeletal side effects that have been reported include, oil embolism, systemic infection, myocardial infarction and cerebrovascular accident.^{3 6 7}

Additionally, the patient experienced tricep tendon rupture at its distal insertion. This is likely related to anabolic steroid use with progressive stiffening of tendons and rupture with repeated weight lifting.⁸

The few cases of natural oil self-inoculation formally reported are likely to be the tip of the iceberg. This is partly due to this practice being relatively unknown among clinicians compared with anabolic steroid use in this patient cohort, and the reluctance of patients to volunteer the information. As demonstrated in our case, there is a risk of late and/or misdiagnosis. Diagnosis can be further confounded by a latent period before reaction to the enhancement oil.

By reporting this case, we hope to raise awareness of the varied practices among the bodybuilding community and the variety of their potential presentations in the community, clinics and in the accident and emergency setting.

The current discussion provides lessons which are pertinent for general practitioners, radiologists, emergency department and orthopaedic teams, among others.

Learning points

- ▶ This case reinforces the ever-growing range of interventions that bodybuilders are willing to subject themselves to and their variety of clinical presentations.
- ▶ The practice of intramuscular inoculation with oil may be more common than is currently recognised.
- ▶ Despite perceived safety among users, there can be severe, potentially irreversible musculoskeletal and systemic consequences.
- ▶ Clinicians should be wary of the complications if patients disclose enhancement oil injection and be able to provide patient education to discourage this.
- ▶ The potential underlying psychological issues are often underappreciated and should be addressed with a holistic approach.

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