LETTERS TO THE EDITOR

Use of small amounts of ultrasound guided air for injections

The existence and detection of air in various tissues is of great importance, whether the air has emanated by a disease mechanism (for example, intra-abdominal in gastric lesions, extrapulmonary in thoracic lesions) or been applied as a diagnostic tool. The detection of the air in a diagnostic test may be performed by such different methods as stethoscopy (epidurally in the whoosh test¹), or radiography (intra-articularly in arthrography^{2,3}).

In ultrasonography the injection of ultrasound contrast agents containing air may increase the diagnostic confidence in the intravascular domain.^{4,5}

Atmospheric air, which is much cheaper, may be safely injected in small quantities for diagnostic purposes in extravascular domains—for example, joints,⁶ and in our experience also in bursae and tendon sheaths, which all have cavities that can be visualised in this way.

In addition to the standard ultrasonic verification of correct needle placement,⁷ it is possible to monitor and verify the actual injection of the substance by adding a small amount (0.5–1 ml) of air. Figure 1 shows the inflamed tendon sheath of a patient with rheumatoid arthritis. Before injection of cortisone the correct position of the needle is

Figure 1 Thickened tendon sheath before injection. Longitudinal section of the palmar side of the fifth finger. In the top of the image the skin (S) is seen as an isoechoic band with varying thickness. The subcutaneous tissue (SC) is seen as a slightly more hypoechoic band below the skin. The thickened and irregular tendon sheath (TS) is seen both above and below the tendon (T). The proximal phalanx is indicated by long vertical arrows and the metacarpal bone is indicated by short vertical arrows. Local anaesthesia (LA) is applied and is seen as an expanding fluid collection indicated by the oblique arrow.

verified as well as the correct placement of the substances injected through this needle. The air is readily discernible on the screen (fig 2A-D), and the flow of the air in both proximal and distal direction along the tendon can be visualised. The procedure can be performed in an outpatient clinic with the aid of an assistant.

We do not propose that all injections should be carried out under the guidance of ultrasound, however, during training of the thera-

pists or in scientific studies the placement of the injection may be assured in this way.

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Figure 2 Ultrasound guided injection. (A) The needle has been inserted and is indicated by arrows. The leftmost arrow points at the needle tip. Small amounts of air are seen escaping the needle tip (short arrows), spreading out in the cleavage between the tendon and the thickened tendon sheath. TS = thickened tendon sheath; T = tendon; NT = needle tip; PP = proximal phalanx; MC = metacarpal bone. (B) and (C) An expanding fluid collection is seen in the cleavage between tendon and tendon sheath. (D) The bolus of the injection is seen as a hyperechoic mass between the tendon and the tendon sheath.

- 1 Lewis MP, Thomas P, Wilson LF, Mulholland RC. The "whoosh" test. A clinical test to confirm correct needle placement in caudal epidural injections. *Anaesthesia* 1992;47:57-8.
- 2 Bradley SA, Chandy J. Air aspiration after double-contrast knee arthrography: a worthwhile exercise? *Br J Radiol* 1991;64:796-7.
- 3 Bliddal H. Placement of intraarticular injections verified by mini air-arthrography. *Ann Rheum Dis* 1999;58:641-3.
- 4 Goldberg BB, Hilpert PL, Burns PN, Liu JB, Newman LM, Merton DA, *et al.* Hepatic tumors: signal enhancement at Doppler US after intravenous injection of a contrast agent. *Radiology* 1990;177:713-17.
- 5 Campani R, Calliada F, Bottinelli O, Bozzini A, Sommaruga MG, Draghi F, *et al.* Contrast enhancing agents in ultrasonography: clinical applications. *Eur J Radiol* 1998;27(suppl):S161-70.
- 6 Newberg AH, Munn CS, Robbins AH. Complications of arthrography. *Radiology* 1985;155:605-6.
- 7 Grassi W, Lamanna G, Farina A, Cervine C. Synovitis of small joints: sonographic guided diagnostic and therapeutic approach. *Ann Rheum Dis* 1999;58:595-7.

Steroid psychosis after an intra-articular injection

Intra-articular steroid injections are a well recognised treatment for rheumatoid arthritis and osteoarthritis with an inflammatory component. It is also clear that the effects of intra-articular steroid treatment are not confined to the joint injected. Steroid is absorbed, inducing improvement in the indices of general inflammation and a clinical¹ and thermographic improvement in other joints.²⁻³ Peak serum steroid levels occur from two to 12 hours after injection, and the drug is completely cleared within three to five days. However, cortisol levels are suppressed by 64-81% at 24 hours after injection, with most patients' values returning to normal by one week; depo-medrone (methylprednisolone acetate) 40 mg is sufficient to induce maximum suppression.⁴ Many complications are known to arise after systemic steroid administration, but we are not aware of any reports of an acute psychosis after a single intra-articular steroid injection in a previously normal person with no past psychiatric history.

A 75 year old woman presented with osteoarthritis of her left hip. Past medical history showed mitral stenosis, atrial fibrillation, and ischaemic heart disease. She had no history of psychiatric illness or dementia. Drug treatment included furosemide (frusemide), digoxin, nifedipine, and warfarin, which she omitted for four days before the injection. The hip was injected with 80 mg depo-medrone and 10 ml 0.5% marcain under x ray control with local anaesthesia. Urografin contrast was used to ensure correct needle placement. No sedatives were given. As the patient required further treatment with warfarin she was kept in hospital. Thirty six hours after the injection she developed paranoid delusions, visual and auditory hallucinations. There was no evidence of infection, with a normal chest x ray and clear midstream urine.

Urea and electrolytes, glucose, a full blood count, and calcium were normal. The patient required sedating with stelazine owing to severe agitation, and the psychosis persisted for three days, then resolved, and the patient was discharged. At a six week follow up a mini-mental state examination was performed, which showed no underlying abnormality.

A previous case has been reported⁵ of a 41 year old patient with rheumatoid arthritis who became elated, disorientated, and emotionally labile after intra-articular injections of 40 mg methylprednisolone into both shoulders, but this patient had already developed an acute organic confusional state after being treated with prednisolone 2.5 mg three times a day for 12 days only two weeks previously.

In a multicentre prospective study, psychiatric symptoms have been recorded in 1.3% of subjects receiving less than 40 mg/d prednisolone, in 4.6% of those receiving 41-80 mg/d, and in 18.4% of those receiving more than 80 mg/d.⁶ However, a lack of a past psychiatric history does not prevent psychiatric complications as symptoms only occur in 11% with a known psychiatric history.⁷ Methylprednisolone (80 mg) injected into an osteoarthritic knee joint has been shown to lead to a mean peak plasma concentration of 169 ng/ml at eight hours after injection.⁸ After a 20 mg oral dose of prednisolone a peak plasma concentration at two hours of 220 ng/ml has been shown.⁹ As the equivalent dose of methylprednisolone to prednisolone (and prednisone) is 4 to 5 respectively these represent comparable levels.

It may be expected that a more rapid absorption of methylprednisolone would occur in patients with rheumatoid arthritis rather than osteoarthritis owing to the hypertrophied and inflamed synovium. However, the rate or extent of absorption is not significantly different,⁸ and therefore patients with rheumatoid arthritis or osteoarthritis are equally likely to have systemic effects. If two joints are injected with 80 mg depo-medrone then the mean maximum serum concentration is almost six times greater than if only one joint is injected.⁴

Intra-articular injections are commonly given to outpatients and inpatients by all grades of medical staff. Many potential problems may arise and it should be recognised that these may be induced by a single intra-articular dose.

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- 1 Dixon ASJ, Bywaters EGL. The effect of intra-articular injection of cortisone acetate and of hydrocortisone acetate in rheumatoid arthritis. *Clin Sci* 1953;12:15-31.
- 2 Bird HA, Ring EFJ, Bacon PA. A thermographic and clinical comparison of three intra-articular steroid preparations in rheumatoid arthritis. *Ann Rheum Dis* 1979;38:36-9.
- 3 Esselinckx W, Bacon PA, Ring EFJ, Crooke D, Collins AJ, Demottaz D. A thermographic assessment of three intra-articular prednisolone analogues given in rheumatoid synovitis. *Br J Clin Pharmacol* 1978;5:447-51.
- 4 Armstrong RD, English J, Gibson T, Chakraborty, Marks V. Serum methylprednisolone levels following intra-articular injection of methylprednisolone acetate. *Ann Rheum Dis* 1981;40:571-4.
- 5 Baloch N. Steroid psychosis: a case report. *Br J Psychiatry* 1974;124:545-6.
- 6 Boston Collaborative Drug Surveillance Program. Acute adverse reactions to prednisone in relation to dosage. *Clin Pharmacol Ther* 1972;13:694-8.
- 7 Lewis DA, Smith RE. Steroid-induced psychiatric syndromes. A report of 14 cases and a review of the literature. *J Affect Disord* 1983;5:471-7.

8 Bertouch JV, Meffin PJ, Sallustio BC, Brooks PM. A comparison of plasma methylprednisolone concentrations following intra-articular injection in patients with rheumatoid arthritis and osteoarthritis. *Aust NZ J Med* 1983;13:583-6.

9 Wilson CG, Ssendagire R, May CS, Paterson JW. Measurement of plasma prednisolone in man. *Br J Clin Pharmacol* 1975;2:321-5.

Familial macrophagic myofasciitis

Macrophagic myofasciitis is an emerging entity that was first reported in the *Lancet* in August 1998.¹ Between May 1993 and 1999 more than 50 cases have been described in France.² We report the first familial case of macrophagic myofasciitis.

A 45 year old woman was first admitted to hospital in July 1997 for pain and swelling of the right foot lasting for few months. Muscle biopsy of the right foot showed interstitial fibrosis with marked perivascular lymphocytes infiltrate. Only a few macrophages were seen but not in the subcutaneous tissue, epimysium, perimysium, and perifascicular endomysium. Periodic acid-Schiff (PAS) staining was negative. A diagnosis of focal myositis of the right foot was made³ and she received colchicine 1 mg daily. In November 1997 she was referred to our institution because her condition had not improved. At that time erythrocyte sedimentation rate (ESR), creatine kinase (CK), aldolase, and autoantibodies were normal or negative. Because focal myositis can evolve to polymyositis,⁴ an electromyography was performed showing a diffuse myopathic process. A muscle biopsy was performed in the deltoid but was normal. Myopathic electromyography was imputed to colchicine and this treatment was discontinued. A diagnosis of reflex sympathetic dystrophy of the right foot was proposed and calcitonin injections were started. In April 1998 the foot symptoms completely disappeared. In February 1999, diffuse myalgia appeared. Clinical examination was normal as were the laboratory and the second electromyography findings. However, a third muscle biopsy of the deltoid was performed and showed infiltration of the subcutaneous tissue, epimysium, perimysium, and perifascicular endomysium by sheets of non-epithelioid PAS-positive cells of macrophagic lineage typical of macrophagic myofasciitis (fig 1A).

In February 1999 her 11 year old son was referred to our institution for mild chronic myalgias and asthenia of two years' duration. Clinical examination was normal as were laboratory findings (including CK, aldolase, ESR) and electromyography. Nevertheless, in view of the mother's disease and despite the absence of objective signs, a left deltoid muscle biopsy was carried out. The findings were characteristic of macrophagic myofasciitis (fig 1B).

Our two cases of macrophagic myofasciitis underline the pitfalls of this diagnosis, especially the influence of the biopsy site for the demonstration of its typical pathological features. Owing to the rarity of macrophagic myofasciitis, the occurrence of the disease in the mother and her son is unlikely to be coincidental, and therefore probably reflects either a common genetic predisposition or the presence of the causative agent in the environment, or both. Of note is the fact that onset of clinical

Figure 1 Muscle biopsy on light microscope. (A) Sheet of macrophages with some lymphocytic cells infiltrated from epimysium to perimysium surrounding muscle fibres. (Mother's case, paraffin embedded section, haematoxylin and eosin stain, $\times 270$.) (B) Infiltration of the subcutaneous tissue by densely packed large and grossly rounded cells with clear, slightly basophilic cytoplasm corresponding to macrophagic cells. (Children's case, paraffin embedded section, haematoxylin and eosin stain, $\times 540$.)

manifestations leading to the diagnosis of macrophagic myofasciitis occurred 24 and 18 months after immunisation against hepatitis B virus (HBV) (Genevac B, Pasteurs vaccins, Lyon, France and Engerix B, Smithkline Beecham, Nanterre, France) in mother and son, respectively. Additionally, both patients were vaccinated in the same side as the positive muscle biopsy (that is, the left deltoid) and a prior biopsy of the right deltoid of the mother was negative.

The putative role of the aluminic component of several vaccines—namely, those against HBV, has been recently suggested.⁵ If confirmed, this hypothesis should also consider the potential influence of the genetic background, as millions of French people have been recently immunised against HBV, whereas only a few dozen cases of macrophagic myofasciitis have been diagnosed. However, the possible role of currently unidentified environmental factors cannot be ruled out, given that macrophagic myofasciitis occurred concomitantly in our familial case report.

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- 1 Gherardi RK, Coquet M, Cherin P, Authier FJ, Laforet P, Belec L, *et al*. Macrophagic myofasciitis: an emerging entity. *Lancet* 1998;352: 347–52.
- 2 Cherin P, Authier FJ, Laforet P, Abdelmoumni A, Creange A, Bonnotte B, *et al*. Macrophagic myofasciitis in patients with demyelinating central nervous system disease [abstract]. *Arthritis Rheum* 1999;42(suppl):S156.
- 3 Kalden P, Krause T, Volk B, Peter HH, von Kempis J. Myositis of small foot muscles *Rheumatol Int* 1998;18:79–82.
- 4 Flaisler F, Blin D, Asencio G, Lopez FM, Combe B. Focal myositis: a localized form of polymyositis? *J Rheumatol* 1993;20:1414–16.
- 5 Cherin P, Gherardi R, Coquet M, Chariot P, Belec L, Authier FJ, *et al*. Myofasciite à macrophages: rôle des vaccins aluminiques? *Rev Med Interne* 1999;20(suppl):576S.