

Safety of Subcutaneous Microinjections (Mesotherapy) in Musicians

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Objective: Determine the safety and tolerance of mesotherapy as a technique for the treatment of musculoskeletal complaints in musicians. **Method:** 67 patients (55.2% women) were subjected to a total of 267 mesotherapy sessions. A mesotherapy needle or normal needle was used randomly. The drugs employed were thiocolchicoside and diazepam as muscular relaxants, pentoxifylline or buflomedil as vasodilators, and piroxicam as an anti-inflammatory, as directed. A visual analogue scale was used to quantify the pain produced by the microinjections as well as the degree of immediate and midterm side effects as reported on a standard questionnaire. **Results:** A mean of 155.5 microinjections were performed per session, of which 45.6% were perceived as painful by the patient with a mean severity of 4.3 out of 10. The pain reduced to 0.5 out of 10 after 24 hours. The most sensitive areas were the levator scapulae and splenius muscles. Systemic symptoms were reported by 5.99% of the musicians after the mesotherapy sessions (muscular weakness 1.5%, rash 1.5%, drowsiness 1.1% and itching 1.1%, being the most frequent). The mean severity of these symptoms was 2.77 out of 10. In all cases the symptoms had completely disappeared after 24 hours. No patient referred to signs of local or systemic infection. **Conclusions:** The application of drugs by means of subcutaneous injections (mesotherapy) in musicians is a technique that is safe, well tolerated, and without any severe complications. *Med Probl Perform Art* 2011; 26(2):79–83.

Mesotherapy is a minimally invasive therapeutic technique created by the French physician Dr. Michel Pistor in 1958 and initially designed to treat pain.^{1,2} It consists of the application, by means of multiple, tangential, deep, intradermal or subcutaneous microinjections, of minimum doses of one or more drugs.³ The basic objective is to produce local effects in deep tissues close to the treated area, with minimum systemic effects and a longer duration of action than other routes of administration.⁴

There are different types of needles and devices for performing mesotherapy. Although the injections can be performed using automatic systems, manual injection enables varying the injection depth to better adjust it to the characteristics of the area treated. The two main types of needles used are the mesotherapy needle (Lebel's needle) characterized by a length of 4 mm and a diameter of 0.4 mm, and the 12-mm × 0.3-mm-diameter needle that we call a "normal" needle (Fig. 1). The first is mainly used in areas where there is

a good layer of subcutaneous tissue, and therefore there is no need to adjust to ensure the injection depth of each prick. The normal needle is generally used in areas where there are structures such as bone, tendons, vessels, or nerves and where the injection depth must be controlled with greater precision.

Although there are no studies on this aspect, because the mesotherapy needle is of greater caliber, it is assumed to introduce a larger amount of medication, and because it is also shorter, it has the advantage of being able to be used at a higher rate and, therefore, is better tolerated. Its main inconveniences are that it causes more pain on insertion and a higher number of subcutaneous hematomas.

In 1981, Dr. Jacques Le Coz introduced mesotherapy into the orthopaedic clinic at the Institut National du Sports (National Institute of Sports) in Paris. In 1987, the French Academy of Medicine officially recognized mesotherapy as a legitimate treatment modality within conventional medicine, and actually it is mainly used in other fields such as aesthetic medicine.¹ The current fields of application involving musculoskeletal complaints are multiple and include, for example, irritant microtraumatic processes on a muscular, tendinous, periosteal, insertion, or nerve level to degenerative processes such as trapezius-metacarpal osteoarthritis or temporomandibular joint disorders.

The Institut de Fisiologia i Medicina de l'Art (Institute of Physiology and Medicine of Art) in Terrassa, Spain, a centre specialised in the medical care of performing artists, introduced this therapeutic tool to treat musicians in the mid-90s because of the advantages of being able to apply medicinal products without the characteristic and annoying undesirable effects of systemic application. For example, it is possible to administer a muscle relaxant for a contracture at the level of the trapezius muscle without the patient experiencing drowsiness, lack of concentration, decreased attention span, etc. For this reason and although its effectiveness has only been partially demonstrated in some studies,⁵⁻¹⁰ our impression, after over 18 years using this technique in the treatment of musculoskeletal complaints of the musician, is that it is an effective procedure for this group of patients.

Mesotherapy for musculoskeletal problems is not regulated in our country. This means that there is no law prohibiting its use but also no official guidelines to perform it safely.

The use of this technique has increased notably over the last few years, and although there are no studies that confirm it, it is considered a safe technique, with enormous local efficacy and no systemic effects. However, the lack of publications means that both its efficacy and safety are progressively being questioned.^{9,11-21} For this reason, this study considers

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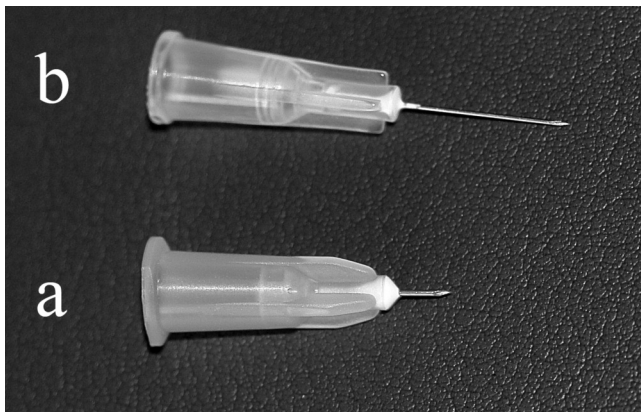


FIGURE 1. Mesotherapy needle (a) and normal needle (b).

the safety of mesotherapy as a technique applied to the treatment of disorders of the locomotor apparatus in musicians, while at the same time evaluating and comparing the tolerance of different drugs with similar therapeutic effects as well as the two types of needles used to apply this technique.

MATERIALS AND METHODS

Patient Sample

Over a period of 1 year, information was collected on 67 musicians consecutively attending our center suffering from osteomuscular disorders related to their instrumental activity who were not getting enough improvement with physical therapy. This provided a sample of 30 males (44.8%) and 37 females (55.2%), with a mean age of 29.6 ± 10.0 yrs (range 14-58). The sample included 15 pianists, 8 violinists, 8 guitarists, 5 percussionists, 4 clarinetists, 4 flautists, 4 saxophonists, 3 trumpeters, 3 violas, 3 trombonists, and 10 musicians who played other instruments.

Method

The musicians suffering from muscular contraction (cervical, dorsal or lumbar), effort myalgia in the forearms, neuritis of the cubital nerve at an elbow level, de Quervain's stenosing tenosynovitis, synovial cyst of the back of the wrist, subacromial syndrome of the shoulder, or other types of tendinopathy were subjected to mesotherapy sessions of the affected area using, where possible and by random assignment, the normal or mesotherapy needle. The drugs used were thiocholchicoside (Coltramil®) or diazepam intravenous (i.v.) as muscle relaxants, pentoxifylline i.v. (Hemovas®) or buflomedil i.v. (Lofton®) as vasodilators, and piroxicam i.v. (Feldene®) as an anti-inflammatory agent. Treatment of muscle contractures used a mixture of muscle relaxant and anti-inflammatory drugs in a proportion of 1:1. All other cases used a combination of a vasodilator and an anti-inflammatory in a proportion of 1:1. Penetration of the medicinal product was improved in all treatments by adding 2% pro-

caine i.v. in a proportion of 1:1:1. In those cases where two different therapeutic options were available for the same purpose (pentoxifylline/buflomedil and diazepam/thiocholchicoside), the use of one or the other was also assigned randomly.

The mesotherapeutic injection technique used was the one known as *nappage* (from the French for covering), first described by Bourguignon and Ravily.²² With a 5-mL syringe held at a 45° angle from the skin and while applying light, constant positive pressure on the syringe's plunger, the practitioner rapidly flicks the wrist (which can mimic shaking a salt shaker) (Fig. 2). When we use the normal needle, it is not fully inserted, perhaps only 0.5 to 2 mm deep. When we use mesotherapy needle, then a complete (4 mm) insertion is used. In any case, only a drop of solution is introduced at each puncture, and the insertions are done at approximately 0.5-cm intervals. This insertion technique, in expert hands, enables inserting the needle at a rate of approximately 3 microinjections per second.

Maximum asepsis was guaranteed by using disposable gloves and a sterile single-use needle and syringe and by disinfecting the skin with 98° alcohol which was allowed to evaporate completely before proceeding with the injections, and once the mesotherapy was completed, the area was covered with a dressing. The patient was allowed to remove the dressing at least 30 minutes after completing the session without any need to apply any other type of special cure to the treated area.

Records were made of the age, sex, pathology, and treated area for each patient and, for those patients who underwent more than one session, the order number of the session. In musicians who were subjected to more than one session, the time period between mesotherapy sessions was at least 1 week.

Each patient was asked to count all the painful microinjections during performance of the mesotherapy. In addition, they were provided with a questionnaire to be completed with a description of the type and degree of pain during and immediately after the microinjections and the



FIGURE 2. Injection technique shows the needle inclined 45° to the skin surface with superficial insertion of the needle (0.5 to 2 mm).

characteristics and degree of this pain after 1 hr and at 24 hrs after the mesotherapy session. They were asked to describe in detail the local symptoms during the first hour and after 24 hrs. The answers to the questionnaire were simplified by a list of symptoms as a reference, but the patient had the opportunity, in an open field, to describe any other type of symptoms not included on the list.

Each patient was asked to describe the appearance of any general symptoms. The questionnaire included all the symptoms that had been documented for each of the drugs used in the mesotherapy, and again there was the possibility of completing an open field. In the event that any of these symptoms appeared, the patient was asked to determine the time of onset and end of these symptoms. In all cases the patient could select or indicate more than one symptom or characteristic of the symptoms at the same time. The patients were asked to continue follow-up of the symptoms during the 4 wks following the mesotherapy session.

The patient scored the severity of the symptoms on a visual analogue scale. The numerical values obtained were transformed to a scale of 0 to 10. Records were also kept of the number of haematomas that appeared in the area of the microinjections.

The study protocol was reviewed and approved by our Institutional Review Board. All patients signed a consent form.

The data are presented as the mean \pm standard deviation (SD). The results were analyzed statistically using Student's *t*-test for the comparison of means and the chi-squared to compare proportions. All calculated *p* values were two-sided, and *p* values < 0.05 were considered statistically significant. Confidence interval for complication rate was calculated using the formula $\text{CI} = p \pm 1.96 (p \times q/n)^{1/2}$.

RESULTS

A total of 267 mesotherapy sessions were performed. This represented a mean of 4.32 ± 4.06 sessions per patient (range 1–18). The indications for performance of mesotherapy were cervical-dorsal-lumbar muscular contraction (112 sessions), effort myalgia in the forearms (99 sessions), cyst synovial on the back of the wrist (26 sessions), subacromial syndrome (16 sessions), stenotic de Quervain tenosynovitis (11 sessions), cubital neuritis of the elbow (10 sessions), Achilles tendinitis (7 sessions), and other indications (8 sessions). Because some patients received treatment for more than one pathology in the same session, the total number of sessions exceeded 267.

A mean of 155.5 ± 109.3 microinjections were applied per session (range 18–482) of which a mean of $45.6\% \pm 27.4\%$ (range 0–100) were referred to as painful by the patients. This proportion was different in males ($40.7\% \pm 27.6\%$) and females ($49.8\% \pm 26.6\%$) ($t = -2.5$ and $p = 0.012$). The characteristics of the injection pain were described as prick (78.9%), pinching (29.7%), burning (13.9%), electric (10.9%), itch (10.2%), and heat (4.1%) (as each patient could indicate more than one characteristic of the injection, the sum total is $>100\%$). The mean severity of the pain, on a

scale of 0 to 10, was 4.3 ± 2.2 (range 0–10), without any significant differences between sexes. The areas referred to as causing a severity of pain significantly above the mean were the regions corresponding to the levator scapulae (5.65 ± 2.27) and splenius (5.29 ± 2.15) muscles. Those presenting a severity of pain below the mean were the cubital neuritis of the elbow (1.66 ± 1.62) and synovial cyst of the back of the wrist (2.62 ± 1.13). After 1 hr, the mean severity of the pain had dropped by 1.5 ± 1.8 (range 0–7.6). At 24 hrs, the severity was 0.5 ± 1.2 (range 0–5.4).

Local effects reported 24 hrs after the mesotherapy session were reddening around the individual microinjection sites (17.7%), hypersensitivity (13.2%), undefined discomfort (11.7%), itching (5.6%), inflammation (5.3%), pressure (4.9%), burning (3.8%), tension (3.8%), local irritation (3.0%) and reddening of the general treated zone (2.6%). The mean severity of these symptoms on a scale of 0 to 10 was assessed as 0.7 ± 1.5 (range 0–8.28). No patient referred to signs of infection during the 4-wk follow-up period.

When using the mesotherapy needle, the patients referred to 36.6% of the microinjections being perceived as painful. Use of the normal needle resulted in 49.8% of the microinjections being painful ($t = 3.6$ and $p = 0.000$). To prevent any bias that could be introduced by the area treated or drugs used, the same proportions of painful microinjections were analyzed in patients treated for effort myalgia in the forearms. In this case, patients treated using a mesotherapy needle referred to 26.0% of painful microinjections, whereas those treated with a normal needle reported 49.5% ($t = 4.1$ and $p = 0.000$).

The normal needle caused a mean severity of pain during the injection of 3.9 ± 2.2 and the mesotherapy needle 4.8 ± 2.2 ($t = -2.9$ and $p = 0.004$). The type of pain was not shown to be different between the two types of needles. After 1 hr, there were no significant differences in the degree of pain in both subgroups.

In 81 sessions patients referred to the appearance of one or more hematomas at the injection site ($n = 262$, 30.91%). A total of $2.87\% \pm 8.29\%$ (range 0–70.91) of the microinjections caused the appearance of a subcutaneous hematoma, there being no statistically significant differences between the two needles. Among females, 3.83% of the microinjections caused the appearance of hematomas, whereas this was 1.76% in males ($t = -2.018$ and $p = 0.045$). The subgroups of men and women were homogeneous in regard to the proportion in whom one type of needle or another was used, the type of disorder suffered, and the drugs used.

When pentoxifylline was injected, 64.0% of the microinjections were painful, compared to 43.7% when buflomedil was applied ($t = 3.3$ and $p = 0.005$). Pentoxifylline caused a sensation of heat after 1 hr in 58.3% of cases, and buflomedil in 20.7% of cases ($p = 0.006$). This sensation was maintained after 24 hrs in 25.0% of the cases treated with pentoxifylline and in 2.6% of those using buflomedil ($p = 0.007$). Diffuse pain at 24 hrs was more common with pentoxifylline (41.7%) than with buflomedil (11.2%) ($p = 0.01$). The sensation of swelling at 24 hrs was more common with pentoxifylline (25.0%) than with buflomedil (4.7%) ($p = 0.024$).

TABLE 1. Systemic Effects Occurring with Mesotherapy Injections

Systemic Effects (n = 266)	%	95% Confidence Interval
Muscular weakness	1.5	0–2.961
Rash	1.5	0–2.961
Drowsiness	1.1	0–2.353
Itching	1.1	0–2.353
Dizziness	0.8	0–1.871
Reduced performance	0.8	0–1.871
Loss of appetite	0.8	0–1.871
Fatigue	0.4	0–1.159
Nausea	0.4	0–1.159

There were no differences in the percentage of painful microinjections when applying diazepam or thiocolchicoside. The sensation of burning 1 hr after mesotherapy occurred in 41.5% of cases with diazepam and 18.6% with thiocolchicoside ($p = 0.01$).

On 16 occasions (5.99%), the musicians referred to systemic symptoms after the mesotherapy sessions, but the proportions were between the confidence levels (Table 1). The mean severity of these symptoms on a scale of 0 to 10 was assessed as 2.77 ± 2.29 (range 0.23–7.73). In all cases the symptoms had completely disappeared after 24 hrs. Apart from these symptoms, patients also were asked specifically about the presence of heartburn, stomatitis (with or without ulcers in the mouth), vomiting, abdominal pain, diarrhea, constipation, instability, alteration of the intestinal rhythm, slow thinking, confusion, vertigo, speech difficulties, excitation, anxiety, sleep disorders, altered sensitivity, headache, double vision, urticaria, asthma, depression, tremors, incontinence, urine retention, dryness of the mouth, hot flushes, tachycardia, and systemic infection. None of the musicians mentioned experiencing any of these symptoms.

DISCUSSION

The primary endpoint of this study was to establish the safety of this technique. Systemic symptoms appeared very sporadically (5.99%) with a very low severity (2.77 out of 10) and disappeared within a few hours. Furthermore, as these patients were not examined in the search for other possible causes of these symptoms, it cannot be ruled out that, at least in some cases, they were the result of coincidence or even suggested by the questionnaire itself. On the other hand, low severity local effects present at 24 hours were mentioned by less than 20% of patients and went no further than reddening around the microinjection sites and a sensation of hypersensitivity of the treated area. In this same sense, infection, one of the most important complications related to mesotherapeutic treatment by some authors^{15,17,18} did not appear in any of the cases. In view of the above, we believe that we can consider this procedure to be safe provided it is applied correctly.

The second endpoint was to determine the tolerance of musicians to this technique. In regard to discomfort on a local level, when mesotherapy is applied by expert hands, the prick rate is extremely high and this means that less than half the microinjections are perceived as painful. This, together with the fact that the severity of the pain was moderate and disappeared rapidly (4.3 out of 10, dropping to 1.5 after 1 hr and to 0.5 after 24 hrs), clearly indicates good tolerance by the patients. However, we noted that, apart from a certain individual variability to pain when subjected to this technique, there are common factors that enable predicting just how painful the injections will be. In general, the injections cause more pain in women and when the application is in the cervical area (levator scapulae and splenius muscles), whereas the best tolerated microinjections are those of the epicondyle-olecranon and the back of the wrist.

In third place, this route of administration also manages to elude, to a great extent, any systemic side effects. We especially refer to the deleterious effect that muscle relaxants have on the performing capacity of musicians, as they cause drowsiness, slow thinking, and reduced performance. As we have shown, systemic effects were infrequent and, above all, of very low severity.

On the other hand, this study also enabled us to obtain information on needle selection. It should be understood, however, that in any case, some areas where the layer of the subcutaneous tissue is not very thick, use of the mesotherapy needle is not appropriate. As already mentioned, this needle ensures an insertion depth of 4 mm but seriously compromises penetration to a lesser depth than 4 mm as it cannot be inserted tangentially into the skin because of its greater thickness and very short length. This could be an inconvenience in those areas, such as the wrist, elbow, or knee, where structures that we do not want to prick (tendon, bone, joint capsule, nerves, etc.) are very close to the surface. In these cases there is no choice, and we must use the normal needle.

In those cases where both needles may be used (cervical, dorsal, lumbar areas, shoulder, back of the forearm, etc.), the choice of needle should consider the following. The normal needle presents a greater number of microinjections perceived as painful whatever the area treated or drug used, but the pain is less intense. However, as the mesotherapy needle is thicker (and this surely justifies each of the microinjections being perceived as more painful), the reason why a lower number of these microinjections are perceived as such must be because the needle enables a much higher injection rate. This could exceed the patient's capacity to discern whether there have been one or two microinjections and so reduces the total number perceived as painful. The injection rate not only depends on the type of needle, but also on the degree of training of the therapist. In view of the above we are inclined to think that the choice of one or the other needle is only relevant in the case of inexperienced therapists. In this case, whenever possible, it would always be better to use the mesotherapy needle. This enables ensuring a constant insertion depth, a higher injection rate, and, as a result, a better tolerated treatment.

The last question to consider in this study is whether, in those patients where different therapeutic options are available, we have been able to detect any drug that is better tolerated than another. In the case of vasodilators we observed that buflomedil was better tolerated than pentoxifylline, both locally and systemically. In regard to muscle relaxants, thiocolchicoside and diazepam were well tolerated at the time of application, but the latter presents a greater burning sensation 1 hr after administration.

In summary, this study provides information on a large number of musicians subjected to mesotherapy treatment sessions. This has enabled us to see that, if applied correctly and by trained staff, mesotherapy is a safe and well-tolerated technique that causes little local discomfort and does not bring about any significant systemic effects or complications.

REFERENCES

1. Le Coz J: Mesotherapie in Medecine Generale. Paris, Masson, 1993.
2. Pistor M. [What is mesotherapy] [in French]? *Chir Dent Fr* 1976; 46:59-60.
3. Le Coz J, Chos D: Mesoterapia y Traumatología Deportiva. Paris, Masson, 1989.
4. Le Coz J: L'injection en regard du genou par voie mésothérapique donne de bonnes concentrations intra-articulaires. *Quotidien du médecin* 1983; Sept 20.
5. Guazzetti R, Iotti E, Marinoni E. [Mesotherapy with naproxen sodium in musculoskeletal diseases] [in Italian]. *Riv Eur Sci Med Farmacol* 1988; 10:539-542.
6. Menkès C], Laoussadi S, Kac-Ohana N, Lasserre O. [Controlled trial of injectable diclofenac in mesotherapy for the treatment of tendinitis] [in French]. *Rev Rhum Mal Osteoartic* 1990; 57(7-8): 589-591.
7. Palermo S, Riello R, Cammardella MP, et al. [TENS + mesotherapy association in the therapy of cervico-brachialgia: preliminary data] [in Italian]. *Minerva Anesthesiol* 1991; 57(10): 1084-1085.
8. Soncini G, Costantino C. [The treatment of pathologic calcification of shoulder tendons with E.D.T.A. bisodium salt by mesotherapy] [in Italian]. *Acta Biomed Ateneo Parmense* 1998; 69(5-6): 133-138.
9. Rohrich RJ. Mesotherapy: What is it? Does it work? *Plast Reconstr Surg* 2005; 115(5): 1425.
10. Cacchio A, De Blasis E, Desiati P, et al. Effectiveness of treatment of calcific tendinitis of the shoulder by disodium EDTA. *Arthritis Rheum* 2009; 61(1): 84-91.
11. Atiyeh BS, Ibrahim AE, Dibo SA: Cosmetic mesotherapy: between scientific evidence, science fiction, and lucrative business. *Aesthetic Plast Surg* 2008; 32(6): 842-849.
12. Brown SA: The science of mesotherapy: chemical anarchy. *Aesthetic Surg J* 2006; 26:95-98.
13. Chase CC: Common complications and adverse reactions in a mesotherapy practice. *Am J Mesother* 2005; 1: 14-15.
14. Vedamurthy M: Mesotherapy. *Indian J Dermatol Venereol Leprol* 2007; 73:60-62.
15. Nagore E, Ramos P, Botella Estrada R, et al: Cutaneous infection with *Mycobacterium fortuitum* after localized microinjections (mesotherapy) treated successfully with a triple drug regime. *Acta Derm Venereol* 2001; 81:291-293.
16. Tor PC, Lee TS: Delirium with psychotic features possibly associated with mesotherapy. *Psychosomatics* 2008; 49(3): 273-274.
17. Michel-Batôt C, Dintinger H, Blum A, et al: A particular form of septic arthritis: septic arthritis of facet joint. *Joint Bone Spine* 2008; 75:78-83.
18. Gamo R, Aguilar A, Cuétara M, et al: Sporotrichosis following mesotherapy for arthrosis. *Acta Derm Venereol* 2007; 87(5): 430-431.
19. Rosina P, Chieragato C, Miccolis D, D'Onghia FS. Psoriasis and side-effects of mesotherapy. *Int J Dermatol* 2001; 40(9): 581-583.
20. Lee DP, Chang SE. Subcutaneous nodules showing fat necrosis owing to mesotherapy. *Dermatol Surg* 2005; 31(2): 250-251.
21. Brandão C, Fernandes N, Mesquita N, et al. Abdominal haematoma—a mesotherapy complication. *Acta Derm Venereol* 2005; 85(5): 446.
22. Mrejen D, Perrin JJ. Mesotherapie et Rachis. Editions S.F.M. CERM. Ile de France, CRM Champagne, 2003.