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Original Article

Efficacy of Ultrasound-Guided Interventions in Musculoskeletal Pathologies

Nilesh Gupta[1], Praful Agnihotri[2], Mohammed Ibrahim[3], Waqas Ali[4]

[1]Associate Professor, Department of Radiodiagnosis, SBIMS, Raipur, Chhattisgarh, India, [2]Consultant Anaesthesia Physician (DNB Teacher), Department of Radiodiagnosis, SBIMS, Raipur, Chhattisgarh, India, [3]Consultant Orthopaedic Surgeon, Department of Radiodiagnosis, Mediclinic Hospital, Abu Dhabi, UAE, [4]Tech, Sonographer, Department of Radiodiagnosis, Life Care Hospital, Abu Dhabi, UAE

Abstract

Ultrasound (USG) is being increasingly used for the detection of MSK pathologies. Moreover, USG is further utilized for guided interventions such as therapeutic injections, tenotomies, releases, and hydrodissections. Our study is aiming to determine the usefulness of such ultrasound-guided injection (UGI) techniques and comparison of UGI with landmark-guided intervention techniques.

Key words: Arthritis, Injection, Landmark, Musculoskeletal, Tendinopathy, Tendinosis, Tenosynovitis, Ultrasound

INTRODUCTION

Although, USG is operator-dependent and has limited FOV, ultrasound (USG) is extensively utilized to diagnose disorders of bone, joints, tendons, muscles, ligaments, blood vessels, and nerves as well as to guide interventions such as aspirations, diagnostic or therapeutic injections, tenotomies, releases, hydrodissections, and biopsies [Figure 1]. This is because it gives better visualization of soft tissues, no radiation or contrast exposure, ease of performance, repetition, less expense, portability, and better patient cooperation.[1-4]

MATERIALS AND METHODS

We performed our study in a multispeciality 200 bedded hospital on 100 patients on OPD basis [Figure 2].[5] We have a decent emergency and orthopedic workload. The patient who had joint pains, bursitis, inflammatory arthritis, tenosynovitis, chronic tendinopathy, carpal/tarsal tunnel syndrome, and osteoarthritis were selected.

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Two equal groups were made: first once was the ultrasound-guided injection (UGI) group and second was the landmark-guided injections (LGI) group in which the injections were made after recognizing the surface anatomic landmark by palpation method. In the UGI group, screening by high-resolution USG machine, anatomical planes were observed and accurate placement of the needle was done. The USG machine used was Toshiba Aplio with a high-frequency (9–14 MHz) linear transducer. THI and electronic steering functions were routinely used. Doppler was used occasionally for localized cystic lesions to rule out vascular pathology. USGs were always performed by the same sonologist while the same experienced radiologist did the UGIS, which were injections (Steroid/local anesthetic agents in the joint, in peritendinous region, and in bursal collections), needle aspiration, needle lavage – barbotage, and hydrodissection. Common injection sites apart from joints were the subacromial bursa, long head of biceps tendon, tendoachilles, 1st compartment extensor tendons of the wrist, pes anserinus tendon, Hamstring tendon, medial and lateral epicondyles, and plantar fascia [Figure 1].

For injections, the mixture of bupivacaine-methylprednisolone was made by a 25G needle after ruling out drug allergies. Dynamic viewing of the needle into the joint space or peritendinous area was monitored for the accurate positioning of the needle tip [Figure 1]. Caution was made to avoid neurovascular bundle or tendon injury. Patients were assessed at the time of the procedure, 1 month and 3rd for pain, range of movement, tenderness,

Corresponding Author: Dr. Nilesh Gupta, B603 Vardhhman Skyline Opposite Dronacharya School, New Rajendra Nagar Raipur - 492 001, Chhattisgarh, India.

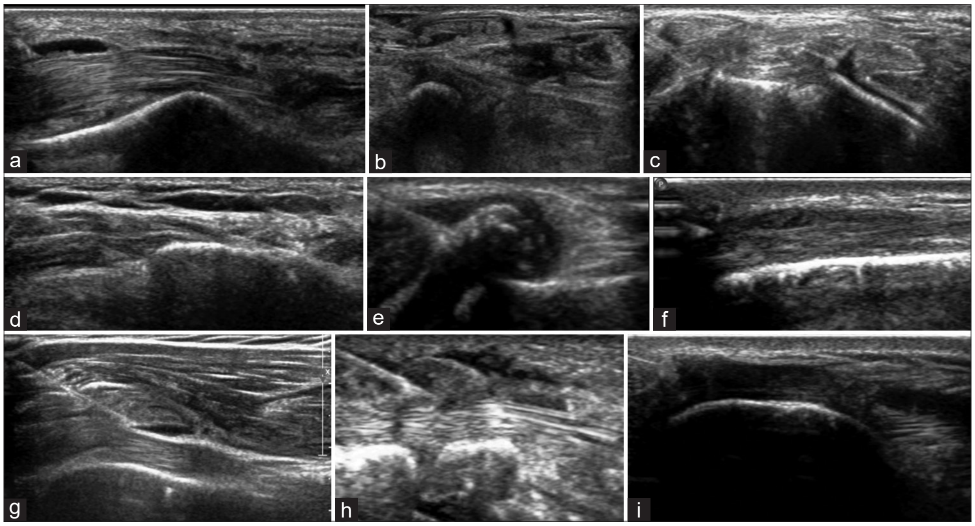

Figure 1: Ultrasound-guided injection; (a) PTT peritendinous, (b) peroneal peritendinous, (c) MTP joint, (d) subacromial, (e) – barbotage, (f) intersecting peritendinous, (g) LHB peritendinous, (h) tibialis anterior peritendinous, (i) rotator cuff peritendinous

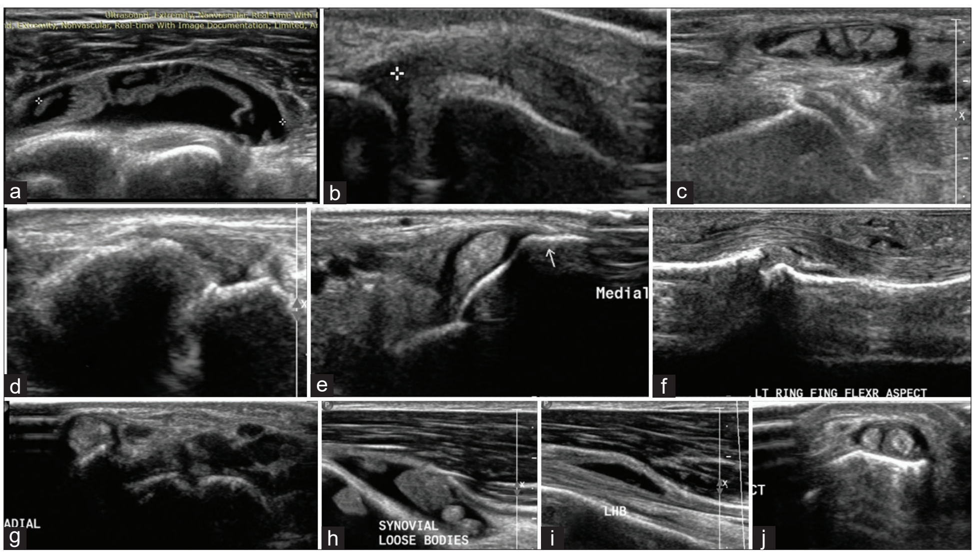

Figure 2: Depicting various MSK pathologies; (a): bursitis, (b): MTP arthritis, (c and d): ACJ arthritis, (e) PTT peritendinitis, (f) trigger finger, (g) tenosynovitis, (h) synovitis, (i) LHB tendinitis, and (j) Quervain's tenosynovitis

improvement in routine functioning, and work activities. The parameters were noted in patients' file. Furthermore, LGIs were performed for ACJ and SIJ, the results were compared to UGIS.

RESULTS

In our study, the most common procedure was peritendinous infiltration followed by joint injections and thereafter hydrodissection.[6] The most common joint was shoulder to target. Joint injections were usually single in ankle, MTP, ACJ, SIJ, and wrist joints. Very few multiple joint injections are made in ankle and subtalar or TMT and MTP joints. The accuracy of UGI group was more precise due to high-resolution soft-tissue differentiation [Figure 1]. Furthermore, the performing radiologist was single, experienced, and skilled. The procedure time of UGI was shorter and periprocedural pain was far less than UGI.[7] UGI was better than LGI only in passive abduction ROM but not in active abduction ROM, pain VAS, and shoulder disability. Efficacy UGI was better than LGI in most of the procedures, except for a few joint injections like SIJ and ACJ.[8,9] Overall, cost-effectiveness of UGI was less. LGI needed more OPD visits and sittings.[10,11]

DISCUSSION

In the last one decade, MSK US studies increased by 3 times and USG-guided procedures by 7 times.

Parameters	UGI	LGI
Procedure time	8–10 min	15–20 min
Peri-procedural pain	Mean score of three out of 10-point scale	Mean score of 6/7 out of 10-point scale
Accuracy	90–95%	60–80%
Post-procedure immediate pain relief	*90%	70%
ROM	*85% (>160°)	65% (<120°)
Efficacy	More than 80%	Around 65%
Safety	More than 97%	Around 60%

*Wrist, SIJ, and ACJ were the exceptions in which the results were almost equal, LGIs: Landmark-guided injections, UGI: Ultrasound-guided injection

UGI was associated with significantly greater improvement in pain, function, and ROM outcomes. UGI was associated with significantly greater improvement in pain, function and ROM outcomes; thereby reducing the need for repeated steroid injections, mainly in tendinous and peritendinous pathology.[7] UGI was safer than blind injections by avoiding neurovascular structures, tendon, less needle trauma, and ability to dilate/hydrodissect with local before injection. UGI was also proved to be more efficacious than LGI in shoulder impingement syndrome outcomes. UGI had higher accuracy for most of the interventions, especially in fluid aspiration and total volume of aspirated fluid. UGI group at the 3-month follow-up revealed less architectural distortion of the anatomical planes in the UGI group. UGI was more accurate than LGI (100% vs. 75.8%) in and around the wrist and ankle joint. UGI significantly reduced procedural pain by half due to higher accuracy of the tissue infiltrated and lesser needle punctures. UGI reduced the cost of patient in OPD setup per year due to fewer hospital OPD visits and high response rates.

Around the wrist, the UGI group had immediate pain relief (within 1st week); however, the ROM and function remained the same in the two groups. No significant differences between the 2 groups in injecting symptomatic SIJ and ACJs were noted since the joints were more superficial and accessible.

CONCLUSION

As compared to LGI, UGI has higher accuracy, safety, reduced procedural time, reduced discomfort, higher short-term clinical outcome in terms of pain reduction, improved function as well as ROM in tendinopathy, bursitis, carpal tunnel area, and large joint osteoarthritis.

Becoming the preferred modality for MSK interventions especially in sports medicine Moreover, US-guided interventions will evolve to perform advanced procedures and USG surgical techniques in the future.

Limitations

Long-term outcomes could not be evaluated due to poor patient follow-up, heterogeneity of joint pathology, and variable treatment modes. The need for large blinded clinical trials in the future is warranted.

DISCLOSURES

None.

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