

Musculoskeletal Ultrasound in Pain Medicine: An Introduction

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INTRODUCTION

Pain management started evolving as a new specialty in the hand of John J Bonica who wrote the book *Management of Pain* in 1953 and started a new era.¹ J Bonica has been considered as “Father of Pain Medicine”. In the initial days, the management of pain was limited to landmark-guided interventional procedures and use of pharmacological and nonpharmacological management of pain in an appropriate situation. Disadvantages of landmark techniques are higher failure rates, use of larger volume of drugs to minimize failure, complications related to inadvertent injection into blood vessels or intrathecal space.

Gradually, C-arm-guided interventional techniques became popular. The biggest advantage was to avoid vascular injection with the use of radiopaque dye. It also helped to reach the target in a better way with lesser failures. Till 1st decade of current century, the C-arm-guided interventional pain management procedures were considered as gold standard in pain management. But C-arm can show bones only and few other structures with injection of radiopaque dye. C-arm cannot show, muscles, tendons, ligaments, nerves and blood vessels. Thus, injury to these structures was still possible. Moreover, diagnosis of different painful musculoskeletal conditions and appropriate injection right into the pathological area was not possible with C-arm.

Ultrasonography then came in the field of musculoskeletal pain management which helped in both diagnosis and guided procedures. In recent years, many new musculoskeletal disorders were described better with ultrasonography and newer ultrasound-guided interventional techniques are also described. While newer C-arm-guided techniques are rare in past decade, and newer ultrasound-guided procedures are published in almost every month.

HISTORY OF MUSCULOSKELETAL ULTRASONOGRAPHY

Karl T Dussik, a neurologist at the University of Vienna, sought to find brain tumors and the cerebral ventricles by measuring the transmission of ultrasonic rays through the head in 1942. This was probably first use of ultrasound in medicine.²

In 1958, KT Dussik published the first study on musculoskeletal ultrasonography, which assessed the acoustic attenuation of articular and periarticular tissues such as skin, adipose tissue, muscle, tendon, articular capsule, articular cartilage, and bone.³

Berlyne GM was the first to use ultrasound to do a kidney biopsy.⁴ This is referred to as the first ultrasound-guided interventional procedure. Pleural fluid aspiration was performed by Joyner using ultrasound.⁵

Daniel G McDonald and George R Leopold published the first ultrasound image of a human joint in the *British Journal of Radiology* in 1972. They revealed how ultrasound imaging can be used to distinguish Baker's cysts from thrombophlebitis which is common clinical condition.⁶

PL Cooperberg correlated grayscale photographs of synovial thickness and joint effusion in the knee to demonstrate synovitis in rheumatoid arthritis for the first time in 1978.⁷

JS Newman reported the first use of power Doppler in demonstrating soft tissue hyperemia in musculoskeletal illness in 1994.⁸

Anesthesiologists at the University of Vienna first used ultrasonography (US) to guide peripheral nerve blockade (PNB) in the mid-1990s.⁹

Ultrasound-guided Interventions in Regional Anesthesia and Pain Management

While ultrasound-guided interventions started becoming popular since 1970s,¹⁰ ultrasound guided musculoskeletal ultrasound started blooming from early 2000s.¹¹ Ultrasound guided nerve blocks in regional anesthesia started in mid-1990s and gradually became a standard technique in 2010s.

Use of ultrasound guidance in interventional pain management procedures started becoming popular along with ultrasound-guided regional anesthesia. Ultrasound-guided peripheral nerve blocks, cervical facet joint denervation, stellate ganglion blocks were popular. There were growing interest in the application of ultrasonography in pain medicine because ultrasound provides direct visualization of various soft tissues and real-time needle advancement and avoids exposing the healthcare provider and the patient to the risks of radiation.¹²⁻¹⁴

Ultrasound gradually became popular and essential tools in different pain management procedures including lumbo-sacral spine. Intra-articular facet joint injections, sacroiliac joint injections, medial branch blocks became very popular.

Not only interventions, musculoskeletal ultrasound has become an essential tool for diagnosis of different painful conditions too. In many pain clinic evaluation of patients with pain is not complete, unless the painful area is not scanned with ultrasonography. Thus, ultrasound has been considered as eye of a pain physician.

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