Of the 600 species of sea urchins, approximately 80 may be venomous to humans. The long spined or black sea urchin, *Diadema setosum* may cause damage by the breaking off of its brittle spines after they penetrate the skin.

Synovitis followed by arthritis may be an unusual but apparently not a rare sequel to such injury, when implantation occurs near a joint. In this case report, osseous changes were not seen by plain x-rays. Magnetic resonance imaging (MRI) was used to expose the more salient features of both soft tissue and bone changes of black sea urchin puncture injury 30 months after penetration. In all likelihood, this type of injury may be more common than the existing literature at present suggests. It is believed to be the first reported case in this part of the world as well as the first MRI study describing this type of joint pathology.

Local and systemic reactions to puncture injuries from sea urchin spines have been described previously. These may range from mild, local irritation lasting a few days to granuloma formation, infection and on occasions systemic illness.

The sea urchin spines are composed of calcium carbonate with proteinaceous covering. The covering tends to cause immune reactions of variable presentation. There are only a handful of reported cases with sea urchin stings on record, none of them from the Red Sea. However, this condition is probably more common than is thought and can present difficulty in diagnosis. In this case report, the inflammation responded well to heat treatment, mobilization and manipulation of the joint in its post acute and chronic stages. As some subtle changes in soft tissues and the changes in bone were not seen either on plain x-rays or ultrasound scan, gadolinium-enhanced MRI was used to unveil the marked changes in the joint.

**Case Report**

An otherwise healthy 42-year-old male Caucasian scuba diver presented with pain and some swelling in the proximal interphalangeal joint (PIP) of the left 3rd digit. There was a 24 hour history of sea urchin puncture with multiple penetrations of spines into his left hand. The patient experienced pain, discomfort and stiffness of the hand initially. The spines in the carpal region were absorbed within a few days, leaving the 3rd digit swollen and painful. Flexion of the joint was markedly reduced and hand gripping power significantly compromised. Plain x-rays revealed soft tissue swelling with no other changes. Treatment consisted of ultrasound therapy, hot packs and mobilization. There was improvement over a 3 week period, restoring about 50% of the normal flexion as compared to the right 3rd digit. The swelling reduced and hand strength was recovered within 6 weeks.

After 6 months of home application of heat packs and rehabilitation exercises with physiotherapy squeeze-putty, there was residual joint swelling and range of flexion restriction, as well as pain upon lateral pressure of the joint. X-rays revealed no change as compared to the film taken after the injury. The patient was referred to a rheumatologist and was offered local injection of methylprednisolone acetate (Depo Medrol), which he declined.

After 30 months, the swelling and sensitivity persisted, leaving mild mechanical flexion dysfunction of the digit. Another anterior-posterior view was taken with no visible change other than soft tissue swelling. Ultrasound scan of the joint was performed in an attempt to view the soft tissue changes.

The scan did not show any difference between the affected joint and other adjacent joints. At that point, the consulting radiologist suggested an MRI scan with contrast in order to correlate the clinical findings with imaging evidence.

**Imaging**

MRI showed intra articular soft tissue swelling particularly on the medial aspect of the joint. There was moderate hyperintensity on T-1 and T-2 weighted imaging.
Significant but not intense enhancement after contrast administration was evident, with good demarcation from the adjacent soft tissue which did not demonstrate significant surrounding edema.

These findings are consistent with chronic, active synovial inflammation with surrounding fibrosis. There is suggestion of a traction spur laterally and medially and some cortical remodeling possibly indicating the involvement of tendon insertions and adjacent cortex. These are visible on both T-1 and T-2 weighted images and may suggest enthesopathy.5

All these findings are consistent with a chronic, “smouldering” process. These changes were not seen on radiographic or ultrasound examination.5

**Discussion**

Sea urchin puncture injuries are regarded as unpleasant by recreational and professional divers. Dive instruction and its respective professional literature indicates that such accidents result in no more than a painful encounter.7

However, in the minority of cases this type of marine animal sting can be a potential cause of severe, irreversible tissue damage. As subaquatic activity is becoming increasingly popular in the 90s and sea urchin puncture is an everyday event (more common in night diving), some attention must be paid to avoidance by forethought. Changes in ecosystems render some sea urchin species more prolific, at the unfortunate expense of other marine reef inhabitants.8,9

Dreyfus et al. reported two cases in the early 80s involving articular damage resulting from sea urchin spine wound.10–12 One case involved an interphalangeal joint of a male adolescent diver. The second case report involved a middle aged female diver who developed extensive arthritis with deformity and palmar fibrositis. Synovial histology revealed a combination of pasteurelosis infection together with giant cell granulomatous synovitis.
McHugh and Tweed reported in 1984 a case of a 35-year-old Chatham Island fisherman presenting with persisting right ankle inflammation following sea urchin spine penetration. Limitation of movement and swelling was present, as well as plain x-ray findings of opacities in the soft tissues anterior to the joint. Upon surgical exploration, extensive synovitis of the extensor tendons was noted. There was a finding of microscopic foreign fragment particulate material from the urchin spine in the tendon sheath synovial biopsy.

In the case reported here, arthritic changes to the joint are observed, with corresponding mechanical defects. It is unlikely that surgical intervention was indicated in the initial stages of reactive synovitis. The joint seems to be stable and it is unlikely that surgery may be required in the future. It may be assumed that many cases similar to this one occur without reaching the literature. The moderate clinical consequences and lack of standard bone radiography changes leave this type of injury neglected.

The MRI study in this case report highlights the changes in the joint following sea urchin spine puncture. It may be speculated that the synovial irritation mediated by the immunological and chemical reactions from the foreign body and its protein covering also led to direct tissue damage. On reflection of how this case was managed, some or even most of the long standing tissue damage might possibly have been avoided with the early administration of methylprednisolone acetate aqueous suspension by local injection. Obviously, precise determination of such a treatment course must entail several cases and a control group.

Conclusions

There is a tendency to overlook sea urchin spine injury since it resolves without major discomfort or consequences. Due to the nature of this marine animal and human subaquatic limitations, hand and foot injuries are commonest, the reason being that the poisonous sea urchin spines penetrate into synovial joints in the carpal and tarsal regions which are relatively unprotected by a thicker muscle mass or artificial protection.

This case report with MRI investigation outlines the dangers of such an accident. It is important that diving associations and physicians dealing with marine animal stings and bites are informed of the potential long-term damages resulting from this type of injury.

When imaging joints and their adjacent soft tissues, MRI is a better diagnostic tool than plain x-rays and ultrasound. X-rays are very limited in showing soft tissues. Hence, a diagnosis based on subtle changes in synovium and small muscle-insertions cannot be based on plain radiographs. Ultrasound is better than x-rays at imaging soft tissues. However, the ultrasound beam does not penetrate the bone and visualization is adequate only directly underneath the transducer. MRI does not have these limitations.

References