

PERCUTANEOUS NEPHROLITHOTOMY FOR REMOVAL OF A CALCIFIED INTRA-RENAL ARTILLERY SHELL FRAGMENT

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Abstract

Residual metallic fragments after intra-abdominal penetrating injuries due to fragments of artillery shells are generally inert, although they may rarely re-activate. The authors present a case where such a fragment presented as a renal stone 17 years after injury. The literature was reviewed and the initial difficulties with the radiological diagnosis, as well as treatment approaches and post-operative findings are discussed in the light of existing reports. An additional challenge arose as the authors working in a tertiary endourology centre attempted to remain as minimally invasive as possible, but were limited by the very nature of the foreign body.

Introduction

Intra-abdominal penetrating injuries due to fragments of artillery shells usually require open surgery at presentation. Any metallic fragments left *in situ* are commonly believed to be inert. Cases of late “reactivation” of those fragments have been described in different areas of the body, but it is rare for such a metallic fragment to migrate into the renal collecting system many years after injury.

Case report

A 33-year old man presented to the Emergency Department of our hospital with left renal colic. A computed tomographic scan of the kidneys, ureters and bladder (CT-KUB) revealed left 1cm mid-pole renal stone. With hindsight, the stone showed an unusually high density with artefactual sparks which are otherwise typical for metal bodies (Figure 1). Some similar dense structures ≤ 5 mm in size were noted in the subcutaneous tissue of the back. The “stone” colic was treated conservatively and the patient referred to our endourology & stone service for extracorporeal shock wave lithotripsy (SWL).

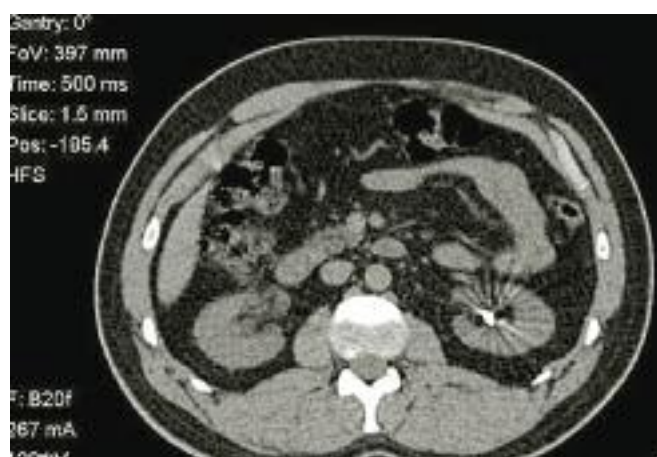


Figure 1. CT scan showing the atypically dense kidney stone with sparkling artefacts.

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Medical history revealed that the patient suffered a major battlefield injury 17 years ago in Afghanistan from an exploding artillery shell. This resulted in a left above-knee amputation and repair of his abdominal wall injuries, as well as post-traumatic stress disorder. Three years prior to presentation he was diagnosed with raised ferritin levels of 295-320 $\mu\text{g/l}$ (normal ≤ 250 $\mu\text{g/l}$). Further investigations of his raised serum ferritin excluded disorders of iron homeostasis, inflammatory processes and inherited haemochromatosis, and was eventually labelled as idiopathic and not followed-up.

After reviewing the CT images, the urologist refrained from SWL treatment as possible stone formation on a metal body could not be excluded and the patient was scheduled for minimally invasive surgical removal. The stone was visualised with flexible ureteroscopy where blank metal could be seen between encrustations. Intracorporeal lithotripsy was therefore contraindicated and the stone was too big to be removed ureteroscopically without fragmentation. The patient then underwent a percutaneous nephrolithotomy with an access through the middle calyx and the metal fragment cum stone was removed *in toto* (Figure 2).



Figure 2. Partially encrusted metal piece after removal from the kidney.

There were no peri-operative complications. However, the removal of the percutaneous nephrostomy left behind in the renal collecting system was delayed by the drainage of some unusual green fluid from the kidney. The nephrostomy was finally removed on the 6th post-operative day after injury to adjacent organs had been excluded. Follow-up was uneventful.

Discussion

Reports of injuries by shell fragments are regularly found in the literature sometimes referred to as “shrapnel” wounds [1]. Management in the acute phase focuses on life saving procedures. Retained fragments in the later phase are usually benign and surgical removal should not be attempted [2]. They are usually encapsulated in fibrous tissue and considered inert. This is however not always true. Late re-activations of retained metallic fragments have been reported for various internal

organs and limbs [3,4]. They then may cause aneurysms, bleeding, cysts or other pathologic changes in organs adjacent to formerly dormant fragments, sometimes after many years.

Radiologically, the change of the fibrous tissue capsule (halo) may be a sign for re-activation. In our case, the typical sparkling artefacts on CT seen with metallic objects raised suspicion with the urologist in charge.

Green fluid excretion is a regular occurrence resulting from oxidative reactions of the iron fragment in the body [4]. However, being unaware of this at the time, this excretion led to a prolonged hospital stay and probably unnecessary investigations to exclude injury to adjacent organs in our patient.

Retained fragments may also release chemical elements resulting in plumbism [5], or intra-corporeal exposure to depleted uranium [6]. The latter had been excluded in our case by examining the harvested fragment for radiation in our nuclear medicine department.

We might speculate that the ferritin level which, was raised for the last three years in our patient, also may have been the result, and as such a possible clue for the re-activation of the metal fragment.

Renal colic caused by shotgun pellets has been reported and is called "buckshot" colic [7]. Buckshot colic usually presents in the early phase after injury and often resolves with spontaneous passage of the pellet. Buckshot colic caused by shell fragments has also been reported. It presents after a median latent period of 11 years and most often necessitates open surgery [8].

Intra-renal surgery today is usually performed in a trans-ureteric or percutaneous minimally invasive fashion [9]. This will remove the fragment, if small enough, *in toto* but will usually not be followed by a thorough intra-renal debridement. Consequently, there can be greenish discharge of oxidative products, which may be unexpected and confusing as in our case.

Typical sparkling artefacts of a renal "stone" on CT combined with a history of battlefield trauma should raise suspicion of a migrating metal fragment. In this case, a surgical removal method must be chosen to remove the fragment *in toto*. If size allows, a minimally invasive approach would be best. Greenish discharge of oxidative products after "stone" removal is to be expected.

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