

PLAIN RADIOGRAPHY FOR IDENTIFICATION OF LIMB FOREIGN BODIES: HOW SUCCESSFUL IS IT?

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ABSTRACT

Objective: To assess the degree of success of two diagonally positioned X-ray radiographies, with careful history taking, in identifying foreign bodies in limbs.

Methodology: A total of 150 patients with suspected soft foreign bodies in their upper and lower limbs referred to Razi and Imam Khomeini Ahwaz University hospitals, Iran, between March 2002 and September 2005 were included in this study. The subjects were carefully examined and a full history was taken. Plain diagonal X-ray radiography was taken. The accuracy of positively identified foreign bodies was calculated.

Results: We were able to identify and successfully remove the soft tissue foreign bodies in 147 (98%) of cases. The remaining three cases were due to non-radio-opaque (fish bone and tree wood particles) and a needle embedded in the third metatarsal bone, which required a second operation.

Conclusions: Two diagonal X-rays of the involved limb, with careful attention to the patient's history are highly successful in identifying the location of soft tissue radio-opaque and non radio-opaque foreign bodies located in limbs.

KEYWORDS: Foreign body, Extremities, Radio-opaque, Non radio-opaque, Diagonal plain radiography.

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INTRODUCTION

Foreign bodies on the basis of X-Ray passage are divided into radio-opaque or non radio-opaque foreign bodies which include metal articles such as needles, bullet particles, small metal objects, mine particles, colored glasses containing heavy metals like borax, small stones and sands which can be seen in traumatic open and closed wounds. The second group includes non-radio-opaque particles such as wood, plastic and similar objects. For accurate localization of these particles ultrasonography, CT-scan and MRI are useful before surgery and fluoroscopy is used during surgery.¹ Ultrasonography with five and seven MHz probes can localize non-radio-opaque particles like

wood and plastic.² CT-scan and MRI are other methods of accurate localizing of foreign bodies. MRI, if done perpendicular to the axis of foreign object, is more sensitive as compared to MRI parallel to the axis of the foreign body.³

Even marked sponges (with radio-opaque strings) and fluoroscopy is sometimes useful in localizing foreign bodies during operation.⁴ Ultrasonography is the best method for localization of the foreign objects and plain radiography is helpful in localization of radio-opaque foreign bodies.⁵ In some cases, ultrasonography can, on the basis of echogenicity, successfully detect the gas surrounding a foreign body.⁶ All these methods are expensive, need specialist and are only available in large equipped medical centers. Furthermore, since fluoroscopic equipments are not always available in all medical centers and performing fluoroscopy during operation exposes the medical personal to unnecessary exposure to dangers of X-Ray.

METHODOLOGY

This is a retrospective study, which was carried out over three years, period March 2002 to September 2005. Patients referred to Razi and Imam Khomeini hospitals, two major medical university centers in Ahwaz, Iran, who had a complaint of penetrating foreign body in their upper or lower limbs were included in this study.

Following careful physical examination and history taking, two diagonal X-rays of the affected limb were taken from all the 150 (age range 6-43, 78 females and 72 males) selected

cases. An incision on the affected limb, under regional or general anesthesia and sterile conditions of preparation and draping, was made and the foreign body was removed.

RESULTS

Sewing needle was the most common penetrating foreign body and most affected limb was the right lower limb (Table-I) and the least foreign body was fish bone, which was confined to females. Fifty one (34%) cases were housewives and eighty six (57.3%) cases were young patients aged less than 18 years old. Air gun bullet and tree wood particles were found in twenty (13.3%) and fifteen (15%), respectively, were only seen in males (Table-I). Glass particles were identified in five females and eleven males, while sand and small stones were found in twenty and three cases of females and one male respectively. In 147 cases (98%) the foreign body was removed in the first surgical attempt, which normally lasted between 15 to 20 minutes. In two failed cases (1.33%) were due to non-radio-opaque foreign bodies due to wood and fishbone, which comprised 11% of total non-radio opaque objects. A second surgical attempt was necessary for removal of these objects. Fluoroscopy was employed for removal of a missed sewing needle (embedded in the third metatarsal bone) case.

DISCUSSION

Retention of foreign bodies can lead to persistent inflammation and infection. Early diagnosis and accurate localization of foreign bodies is necessary for their successful removal.⁷

Table-I: Type, frequency of occurrence and the site of embedment of identified foreign bodies among 150 patients using diagonal X-ray

<i>Foreign body</i>	<i>Frequency (%)</i>	<i>Upper limb (%)</i>	<i>Lower limb (%)</i>
Sewing needle	72 (48)	1 (1.4)	71 (98.6)
Air gun bullet	20 (13.3)	0	20 (100)
Glass particles	16 (10.7)	2(12.5)	14(87.5)
Tree wood particles	15 (10)	1(6.7)	14(93.3)
Fish bone	3 (2)	3(100)	0
Sand and small stones	24 (16)	1(4.2)	23(95.8)
Total	150 (100)	8(5.33)	142(94.66)

Different diagnostic equipments are available for localizing foreign bodies. Existence and localization of foreign bodies can be done by radiography, ultrasonography, CT-Scan, MRI and intra-operative fluoroscopy.¹ MRI, sonography and power doppler are the most sensitive, albeit expensive or need trained staff, methods.^{2,3} In this three-year retrospective study, using two diagonally positioned plain X-ray radiographies, 147 cases out of a total of 150 cases of radio-opaque and non-radio-opaque foreign bodies were identified. Sonography had sensitivity of 92% for the overall detection of foreign bodies,⁸ while power doppler imaging detected the foreign bodies in 100% of cases due to its high sensitivity in detecting the high vascularity surrounding chronically embedded foreign bodies.⁸

Although it is generally assumed that non-radio-opaque subjects can not be detected by plain radiography, our study has demonstrated that modifying this technique by taking two diagonally positioned x-ray radiographs can ameliorate this shortfall. With careful medical history it can successfully be used for detection of both radio-opaque and non radio-opaque objects. The success rate of this technique was found to be 99.25% for radio-opaque objects while for non radio-opaque objects this figure was 89%. Furthermore, although CT and MRI can be used for the detection of wooden foreign bodies in the extremities, they are more expensive than ultrasound and are not easily available.^{9,10} In conclusion, two diagonally positioned x-ray radiographs is highly sensitive and accurate in

the detection of radio-opaque and non radio-opaque objects in the extremities. It is also useful in localizing and removal of foreign bodies, thus minimizing dissection and operating time.

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