Metallic Foreign Body in the Foot

Ayakta Metalik Yabancı Cisim

Yabancı Cisim / Foreign Body

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Özet

Amaç: Ayağın yabancı cisim yaralanmaları sık karşılan bir problemdir. Penetre oldukları dokularda çeşitli komplikasyonlara yol açabilmektedirler. Yabancı cisimleri çıkarmak güç ve zaman alıcı olabilmektedir. Bu nedenle yabancı cisimlerin çıkarılması iyi bir preoperatif hazırlık gerektirir. Bu çalışmada ayakta yabancı cisim batması olarak kırık iğne tespit edilen hastalar ve cerrahi tedavi sonuçları değerlendirildi. Gereç ve Yöntem: Ayağına iğne batması nedeniyle 2011-2013 tarihleri arasında ameliyat edilen 34 hasta (11 erkek, 23 kadın; ortalama yaş 30.2) çalışmaya alındı. Hastaların değerlendirilmesinde etkilenen ekstremite, iğnenin yerleşimi, görüntüleme tekniği, yaralanmanın olduğu mevsim, yaralanma ile müdahale arasında geçen süre, anestezi tipi, cerrahi tedavi sırasında floroskopi kullanımı ve cerrahi müdahaleye bağlı komplikasyonlar incelendi. Bulgular: 20 (%58.8) hastada sağ ayak, 14 (%41.1) hastada sol ayakta iğne batması mevcuttu. Yerleşim yeri açısından; 14 (%41.1) hastada ayak parmaklarında, 12 (%35.2) hastada ayak ortasında, 8 (%23.5) hastada ise topuk bölgesinde kırık iğne tespit edildi. Yaralanma zamanı olarak 13 (%38.2) hastada yaz, yedi (%20.6) hastada kış, bir (%2.9) hastada ilkbahar, 13 (%38.2) hastada ise sonbahar mevsimi olarak belirlendi. İğne batması 28 (%82.3) hastada evde, altı (%17.6) hastada ev dışı ortamda gerçekleştiği tespit edildi. Ortalama takip süresi 8.9±2.8 ay idi. Tartışma: Ayağın yabancı cisim yaralanmalarında cisimlerin çıkarılması iyi bir preoperatif hazırlık gerektirir. Yabancı cisimler penetre oldukları dokularda çeşitli komplikasyonlara yol açabilmektedirler. Ayrıntılı fizik muayene ve radyolojik tetkikler, iyi sonuç alınması yönünden önem taşımaktadır.

Anahtar Kelimeler

Yabancı Cisim; Dikiş İğnesi; Ayak; Floroskopi; Sterotaksik

Abstract

Aim: A foreign body injury of the foot is a frequently encountered problem. These foreign bodies can lead to various complications in the affected tissues, and their removal can be difficult and time consuming. Therefore, the removal of a foreign body requires good preoperative preparations. The surgical treatment results of patients with a foreign body, identified as a sewing needle, that had penetrated their foot were evaluated. Material and Method: Thirty-four patients (11 males, 23 females; mean age, 30.2 ± 18.6 years) who were surgically treated between 2011 and 2013 were included. Data concerning the affected limb, placement of the needle, imaging techniques, season when the injury occurred, time between medical intervention and injury, anaesthesia type, fluoroscopy of use during surgery and surgical complications were analyzed. Results: A sewing needle had penetrated the right foot of 20 (58.8%) patients and the left foot of 14 (41.1%) patients. Broken needles were found in the toes of 14 (41.1%) patients, in the middle of the foot of 12 (35.2%) patients and in the heel area of 8 (23.5%) patients. The injuries occurred in summer in 13 (38.2%) patients, in winter in seven (20.6%) patients, in spring in one (2.9%) patient and in autumn in 13 (38.2%) patients. Needle penetration had occurred in 28 (82.3%) patients at home and 6 (17.6%) patients outside of the home environment. The average follow-up time was 8.9 ± 2.8 months. Discussion: Removal of foreign bodies from the foot requires good preoperative preparations. Foreign bodies can lead to various complications in the affected tissues. It is important to perform detailed physical and radiological examinations to obtain good treatment results in these patients.

Keywords

Foreign Body; Sewing Needle; Foot; Fluoroscopy; Stereotaxic

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Introduction

A foreign body injury of the foot is a frequently encountered problem. The penetrating objects are often pieces of metal or non-radiopaque objects such as pieces of wood or glass [1-3]. Such foreign bodies can cause infection with chronic drainage and pain in the affected tissues where their effect may not be immediate; however, later can cause chronic pain. Furthermore, these foreign bodies can cause damage to neurovascular structures depending on the penetration location [2-6].

Detection and removal of foreign bodies can be difficult. Therefore, removal requires good preoperative preparations [2, 7]. Sometimes foreign bodies can be very difficult to localise and may increase the operation time, also failure to remove the object may cause unnecessary tissue damage [2, 6]. Various removal techniques are used, such as blunt dissection, stereotactic techniques and percutaneous removal, and these techniques may be guided by xeroradiography, computed tomography (CT), magnetic resonance imaging (MRI), fluoroscopy or ultrasound (US) [3, 6-13]. The removal process is sometimes performed in the emergency department or in the operating room, and can be performed under local or general anaesthesia [3, 6, 7].

Sewing needles are found in almost every house in our society; therefore, may pose a risk to family members. Sewing needle penetration of the sole of the foot is seen quite often in our own community and funded mostly ordinary. We believe that a higher incidence of these injuries is a cultural phenomenon, and these injuries are probably less common in other societies. Literature descriptions of detection of broken needles in the body have mostly been presented in reports of metallic foreign body injuries.

In this study, we presented in this study the stinging needle phenomenon as a case series involving patients with foreign body injuries identified as sewing needle penetrations of the sole of the foot and evaluate and discuss the results of surgical treatment.

Material and Method

Thirty-four patients (11 males, 23 females; mean age, 30.2 ± 18.6 years; range, 5–75 years) who were surgically treated between 2011 and 2013 were included in this study (Table 1). All patients underwent preoperative plain radiography. Tetanus prophylaxis was performed for patients with acute injuries who had not had tetanus shots within the last 5 years. All patients underwent preoperative and postoperative prophylactic antibiotic treatment. Data were collected and analysed in all patients regarding the affected limb, placement of the needle, imaging techniques, season when the injury occurred, time between medical intervention and injury, anaesthesia type, scope of use during surgery and surgical complications. The study was conducted in accordance with the Declaration of Helsinki.

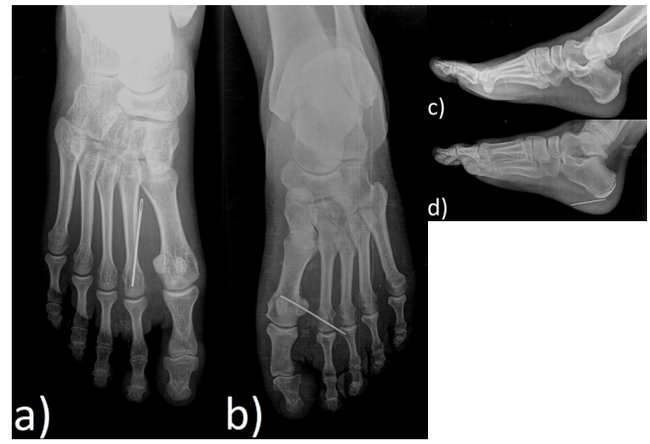
Results

A sewing needle had penetrated the right foot of 20 (58.8%) patients and the left foot of 14 (41.1%) patients (Figure 1). Broken needles were found in the toes of 14 (41.1%) patients, in the middle of the foot of 12 (35.2%) patients and in the heel area of 8 (23.5%) patients. The injuries occurred in summer in 13 (38.2%) patients, in winter in seven (20.6%), in spring in one (2.9%) and in autumn in 13 (38.2%). Needle penetration had occurred in 28 (82.3%) patients at home and outside of the home environment in six (17.6%). The average follow-up time was 8.9 ± 2.8 months.

Table 1. Patient demographic and clinical data.

Number of patients	34
Age, years, mean (range)	30.2 ± 18.6 (5–75)
Sex, n (%)	
Female	23 (67.6)
Male	11 (32.3)
Follow-up, months, mean (range)	8.9 ± 2.8 (6–14)
Location, n (%)	
Right foot	20 (58.8)
Left foot	14 (41.1)
Duration of the operation, minutes, mean (range)	26.3 ± 10.5 (15–45)
Season, n (%)	
Spring	1 (2.9)
Winter	7 (20.6)
Autumn	13 (38.2)
Summer	13 (38.2)
Anaesthesia, n (%)	
Local	19 (55.8)
Spinal	9 (26.4)
Sedation	6 (17.6)

Figure 1. Radiographic images showing broken needles in the feet of patients (a, b, c, d).



During the operation, 19 (55.8%) patients received local anaesthesia, nine (26.4%) received spinal anaesthesia and six (17.6%) were sedated. In the patients who required spinal anaesthesia, the procedure was performed by using a tourniquet. A fluoroscopic device was used to guide removal of the foreign bodies in all patients. In 19 patients with especially deep-seated broken needles in the soles of their feet, at least three 20-gauge injection needles were used to mark the foreign needle location (stereotaxic method) (Figures 2, 3). In the other patients, the foreign needle was marked by making an incision in the skin over the broken needle to allow it to be reached and removed.

The time between the injury and the removal operation was 1 day in 27 (79.4%) patients, 2 to 10 days in four (11.7%) patients, 4 months in one (2.9%) patient, 1 year in one (2.9%) patient and 8 years in one (2.9%) patient. The mean operative time was 26.3 ± 10.5 minutes (range, 15–45 minutes). Four patients were hospitalized for 2 days for postoperative wound

care and antibiotics. The average length of hospital stay was 1.1 ± 0.3 days (range, 1–2 days).

Figure 2. (a, b) A marking method used to aid removal of the broken needle.



Figure 3. Radiographic images of the marking methods used to determine the locations of broken needles (a, b, c, d).



Discussion

Foreign body-related injuries are one of the most common types of injuries seen in the foot [6]. Foreign bodies embedded in soft tissues can be toxic and cause serious allergic reactions, inflammation and infection [3, 5, 14, 15]. The severity of these complications varies. Removal of foreign bodies sometimes can be difficult and time consuming [3, 14, 15]. While attempting to remove a foreign body, larger incisions than those planned may be necessary, and in some cases, may cause more damage than that caused by the initial injury [7, 15].

Although there are no classical methods for preoperative detection of impalpable objects in soft tissue, many different methods can be used [3, 10]. Standard X-ray radiography is the most clinically practical method of screening for foreign bodies [16]. However, radiography may only detect foreign bodies in 15% of affected patients [1]. For detection of non-metallic objects, US, CT and MRI are typically used [3, 6-13]. A study published by Bernardino [4] that compared ultrasound, CT and xeroradiography found that CT was more sensitive for detection of wooden objects. Preoperative determination of the foreign body location decreases the time needed for surgical excision and minimizes unnecessary dissection [6]. Therefore, it is very important to use imaging techniques to determine the correct location. A stereotaxic method is often used for removal of superficial foreign bodies in the absence of a fluoroscopic device [7]. In our study, the use of a stereotaxic method for locating metallic objects in deep tissue decreased the removal time and resulted in less exposure to X-rays when using fluoroscopic equipment.

Sewing needle penetrations of the foot occur commonly in the home [7]. In our study, needle penetrations occurred in 28 (82.3%) patients at home and occurred outside the home environment in six (17.6%) patients. Injuries occurred in 38.2% of the patients in summer, in 38.2% of the patients in autumn, in 20.6% of the patients in winter and in 2.9% of the patients in spring.

It is evident that the most appropriate time to remove a foreign body is immediately after injury. However, a wait of a few days may be acceptable if treatment must be delayed. These injuries usually lead to development of an abscess or fibrous tissue reaction in a few weeks around the foreign body [3-5]. Our best long-term phenomenon, a patient complained of increased foot pain after sports trauma, and we subsequently identified and removed a broken sewing needle from the foot. Symptoms appeared eight years after the apparent trauma, which had been forgotten. The needle was found to be covered with fibrotic tissue.

Foreign body migration varies according to the structural features of the anatomical region where the foreign body settled [14, 15, 17]. Flat plates that are thin, long and localized in the tendon sheath and foreign bodies in the upper extremities can move more easily and over a greater distance than other types of foreign bodies [17]. In our cases, none of the foreign bodies had moved very far from their initial entry points.

Incisions required to remove a foreign body should avoid weight-bearing surfaces and should be followed by creation of a relaxed skin tension line if possible. In long dissections of the plantar, Z incisions or S-shaped incisions can be used at appropriate places if required. We mostly chose mini-incisions because of the fluoroscopic equipment we use and stereotaxic method we prefer. None of our patients experienced problems related to the surgical scar tissue formed after surgery.

The patient's age and location of the foreign body are important factors in decision making for removal of the foreign body in the operating room or emergency room, either performed under general or local anaesthesia [13]. In particular, it is recommended that foreign bodies in paediatric patients and those that are deep seated be removed in the operating room [13]. The interventions in all of our patients were performed in the operating room. During surgery, 19 (55.8%) patients received local anaesthesia, nine (26.4%) patients received spinal anaesthesia and six (17.6%) patients were sedated.

Various techniques have been developed for removal of foreign

bodies [3, 6, 16]. Sharma and Azzopardi [18] reported that radio-opaque bodies were removed by using a marking technique involving three 20-gauge needles. However, many variations can be created with needles placed at various angles for localization of foreign bodies. Mardel [19] stated that the Trendelenburg position for patients with surgical wounds reduced the blood flow to the lower extremities and, thus, enabled sharper images to be obtained that facilitated easier removal of foreign bodies. Some authors have proposed that foreign bodies be removed in the presence of ultrasound in an operating room [9, 13]. Bradley [16] reported a success rate of 88% for removal of percutaneous foreign bodies in the presence of ultrasound. Tao et al. [6] described a 3D CT guidance technique for removal of small superficial metal foreign bodies. Foreign bodies under the skin require relatively complete location information of neighbouring muscles, tendons and neurovascular structures to ensure a more controlled surgical dissection. In our study, nine patients underwent surgical procedures that were performed with a tourniquet. Fluoroscopy was used in all patients for guidance. In 19 patients with especially deep-seated broken needle in the soles of their feet, a marking technique using at least three 20-gauge injection needles (stereotaxic method) was used in different variations to localise the foreign needles. The mean operative time was 26 minutes, and no significant damage occurred to the structures by using this procedure.

Foreign bodies that appear to have been present for a long time in extremities may not require removal because of the lack of functional effects or damage to anatomical structures. Patients with these circumstances have been reported in the literature, and they were informed that there was no need to remove the foreign body [3, 5]. On the other hand, patients showing symptoms require removal of the foreign body. Foreign bodies that cannot be removed might cause serious complications such as infection, delay in healing, persistent pain, migration, cellulitis or pseudotumours [2, 5]. We did not encounter any complications resulting in osteomyelitis in our patients during the follow-up period. Postoperative inflammation at the incision site was detected in four patients. At the end of follow-up, no problems were detected.

Foreign body injuries of the foot should not be considered insignificant. These injuries can easily lead to various complications in the affected soft tissues. Detection and removal of foreign bodies can often be problematic, so good preoperative preparations are required. The structural features of the foreign body should dictate the imaging techniques to be used, if possible. Detailed physical examination and radiological examinations are extremely important for achieving successful treatment of patients.

Conflict of Interests

The authors declare that they have no conflict of interests.

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