Heterotopic ossification in abdominal incision is a rare condition occurring after abdominal surgery which has involved, typically, a midline incision toward the xiphoid process above and the symphysis pubis below. It involves the formation of osseous, cartilaginous and occasionally myelogenous elements within an abdominal wound, and may be misinterpreted as a retained foreign body or incisional neoplastic recurrence (1-3). A few cases have been reported in the surgical literature, but radiologic reports are scarce (1, 4, 5). The authors report a case of heterotopic ossification occurring after abdominal incision; the CT findings and a review of the literature are included.

Case Report

A 59-year-old man who complained of easy fatigability and had a tender, palpable, epigastric mass was referred to our hospital. He had a clinical history of vagotomy and pyloroplasty due to gastric ulcer perforation about ten years earlier. On physical examination, a hard and fixed mass along the incision scar was palpated in the upper midabdomen.

Plain abdominal radiography and abdominal CT scanning were performed; the former revealed a tubular, calcified density in the upper midabdomen. Abdominal CT (Somatom Plus-4, Siemens, Erlangen, Germany) revealed focal dense calcification in the properitoneal fat layer along the upper midabdominal incisional scar [Fig. 1A]. A three-dimensional reconstructed image with surface-shaded display and multiplanar reformation showed a longitudinally oriented, dense, calcified or ossified tubular lesion in the upper midabdominal wall that approximated to the xiphoid process [Fig. 1B, C]. Because we had never encountered a lesion of this kind in an incisional scar, we initially suggested dystrophic calcification or a foreign body reaction in the incisional scar, but then -because of the shape and location, typical of that previously described in the literature- diagnosed heterotopic ossification of a midline abdominal wall incision. In our case, the symptoms were mild and CT revealed no evidence of a soft tissue mass component suggesting malignancy. A conservative approach to man-
agement, aimed at relieving the symptoms without surgical excision, was therefore taken.

Discussion

Heterotopic ossification of midline abdominal scars is a subtype of myositis ossificans traumatica, a condition involving calcification and subsequent ossification after trauma or surgery in which osseous, cartilaginous and occasionally myelogenous elements develop within a scar. The presence of these cartilaginous and bony elements distinguishes this entity from dystrophic calcification (1, 2). Histologically, the ossified scars are composed of mature bone with marrow and cartilaginous elements surrounded by fibrous tissue (1, 4, 5). Heterotopic ossification in abdominal scars is an uncommon sequela of abdominal surgery, having been noted only within longitudinal incisions, never within those which are transverse. It may cause abdominal discomfort or mimic a retained foreign body or recurrence of a malignant condition (1, 3). In general, bone forms within a few months and almost always within one year of surgery (3). Heterotopic ossification in abdominal incisions is clearly male dominant but the exact cause is unknown.

There are two main theories of causation (1, 3-5). The first is that small particles from the periosteum or perichondrium of the xiphoid process or symphysis pubis are inoculated during surgery into the surgical wounds and subsequently lead to bone formation; the theory is supported by the fact that most cases reported in the current literature have occurred after surgery involving vertical incision either from the xiphoid process or to the symphysis pubis. Our patient, too, had undergone upper midline incision, starting from the xiphoid process. This theory does not, however, adequately explain why

Fig. 1. A. Abdominal CT shows ossified midline scar between the rectus muscles (arrow). B, C. A three-dimensional reconstructed CT images with surface shaded display (B) and multiplanar display (C) show a ossified midline scar, which is longitudinally oriented below inferior tip of the xiphoid process (arrow).
heterotopic ossification is infrequent after orthopedic surgery, which leaves a scar exposed to large numbers of osseous particles, or why bone formation in abdominal scars bears no close relation to osseous tissue. According to the second theory, heterotopic ossification arises when immature pluripotent mesenchymal cells differentiate to osteoblasts or chondroblasts in reaction to local injury, resulting in bone formation. This theory does not, though, adequately explain the occurrence of heterotopic ossification only in vertical incisions (3, 4, 5). Jacobs et al. made an alternative suggestion, namely that excessive suture line tension (which may lead to intramuscular implantation and ossification of periosteal particles torn from sites of muscular insertion into bone), with or without associated fascial margin necrosis, may be responsible for a predisposition to heterotopic ossification (1). The literature appears to provide no correlation between wound complications such as infection, keloid, or hyperplastic scars, and the formation of heterotopic calcification. Nor does there appear to be - either in our case or in the literature- any endocrine, metabolic or biochemical disorder, and nor is their apparent correlation with type of closure or any specific suture material or technique (1, 3, 4, 5).

Radiologically, heterotopic ossification typically appears as a longitudinally oriented dense tubular bony structure in a midline abdominal scar between bilateral rectus abdominis muscles, and it is important to distinguish this benign entity from other postoperative complications such as wound infection or a retained foreign body, from an intraincisional mass, and from a primary or metastatic neoplasm such as endometrioma, desmoid, osteosarcoma or mucinous adenocarcinoma. This distinction may be made by correlating clinical history with the typical imaging appearance of heterotopic scar ossification (1).

The treatment of heterotopic ossification in abdominal incisions should be restricted to patients with discomfort. The main treatment modality is surgical excision with primary closure. Non-steroidal anti-inflammatories such as ibuprofen or indomethacin, or external radiotherapy, can be used as a preventive method after surgery involving midline abdominal incision or for the prevention of recurrence after primary excision of heterotopic ossification (6). In conclusion, a diagnosis of heterotopic ossification in abdominal incisions should be considered if a mass is palpated in patients who have previously undergone abdominal surgery and in whom a dense vertical calcified or ossified lesion along the incisional scar is revealed by imaging.

References