Fibrodysplasia ossificans progressiva (FOP) is a rare and disabling genetic disorder characterized by congenital malformation of the great toes and by progressive heterotopic ossification. There is no effective treatment. Conservative management is unsuccessful, and operation result in failure because new ectopic bone forms at the operative site. We report a 10-year-old boy with FOP who underwent surgical management combined with non-steroidal anti-inflammatory drugs (NSAIDs).

Keywords: ectopic ossification, fibrodysplasia ossificans progressiva, chest wall

Introduction

Fibrodysplasia ossificans progressiva (FOP) is an exceedingly rare genetic disorder of connective tissue that is characterized by congenital malformation of the great toes and extensive and irreversible heterotopic ossification of soft tissues.\(^1,2\) No effective, conservative treatment or preventive method has yet been developed.\(^2\) Although surgical management seldom obtains successful results due to the fact that new ectopic bone formation occurs at the operative site,\(^2\) the following case describes surgical management combined with the use of naproxen resulting in a satisfactory outcome.

Case Report

A 10-year-old boy suffered from a tender and painful mass on the anterior chest wall. Since this mass was detected 2 months ago, this mass has progressively enlarged. It was hard, 6-cm sized, and palpated over the right pectoralis muscle. He complained of a progressively decreased range of motion in his right shoulder due to pain (45° of forward elevation, and 45° of abduction). Physical examination revealed typical congenital malformations of the great toes (Fig. 1). His parents did not show any similar abnormalities during their physical examinations. No history of local trauma was reported. A chest roentgenogram demonstrated an abnormal calcification. A computed tomography scan showed a 6-cm sized abnormal heterotopic ossification between the pectoralis major muscle and pectoralis minor muscle (Fig. 2). The diagnosis of FOP was made based on the typical features including congenital malformations of great toes and progressive heterotopic ossification.

Surgical excision of heterotopic ossification from the right chest was performed to improve range of motion for supportive therapy. The intubation was difficult owing to stiffness of the neck during the preoperative induction. The heterotopic bone located in the anterior aspect of his chest was excised as much as possible via anterior approach. We incised pectoralis major muscle and length of incision was about 5cm. During the operation, meticulously cautious efforts were made to avoid surgical trauma. An operation site incision and blunt muscular dissection was applied as little as possible. Convalescence was uneventful. On the second postoperative day, the patient started active physiotherapy. Naproxen (500 mg, once daily, orally) was administered for two weeks.

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after the surgery. The decreased range of motion was fully corrected (180° of forward elevation and 180° of abduction) by the fifth postoperative day. We have detected no evidence of recurrence or sequelae during the nine months follow-up period.

Discussion and Conclusion

Fibrodysplasia ossificans progressiva (FOP) is a rare genetic disorder in which ossificans occurs in muscles or associated connective tissues, or both.1,2) FOP is extremely rare with a worldwide prevalence of approximately one in two million.2) Diagnosis of FOP depends upon the clinical and radiological recognition of the characteristic congenital malformations of the great toes and the progressive ossification of soft tissues.2) The dysmorphic features of great toes in FOP patients are, in general, bilaterally symmetric in marked contrast to the asymmetric distribution of heterotopic bone deposition. Bilateral hallux deformities of great toes are common.3) The common sites of heterotopic ossification are head, neck, spine, and shoulder.1) The bone seems to develop independently of the normal skeleton and forms discrete skeletal elements that can fuse with normal skeletal bone.4) The mean age at the appearance of the first lesion is three years and eleven months.5) In this case, no specific clinical examination was performed even though the anomaly of his great toes was found when the patient was only four years old. FOP is caused by a heterozygous activating mutation of the gene encoding activin receptor A type I/activin-like kinase 2 (ACVR1/ALK2) which encodes a receptor of bone morphogenetic proteins (BMPs).4) There appears to be no ethnic, racial, gender or geographic predisposition.2) Although most cases of FOP are sporadic, FOP can be inherited in an autosomal dominant pattern.2) Early FOP lesions contain an intense perivascular B-cell and T-cell lymphocytic infiltration. Subsequent migration of mononuclear inflammatory cells into affected muscle precedes widespread myonecrosis. Following an inflammatory stage, an intense fibroproliferative reaction associated with robust angiogenesis and neovascularity is noted.1) There is no effective therapy for FOP. Many conservative treatments such as non-steroidal anti-inflammatory medications, cyclo-oxygenase-2 inhibitors, leukotriene inhibitors and mast cell stabilizers have been used with no apparent positive results.2) Surgical excision of heterotopic bone is doomed to failure because new ectopic bone forms rapidly at the operative site.1,2) Bone formation at the operative site usually occurs within 4 months after operation.5) However, some good results have been reported.1,5) In this case, heterotopic ossification was considered as the cause of progressive decreased range of motion. Surgical excision of heterotopic bone, therefore, was recommended to relieve the limitation of motion after informed consent about the risk of recurrence was obtained from the patient and his parents. After surgical excision of heterotopic ossification was performed, naproxen was administrated per oral for two weeks in order to minimize the risk of heterotopic bone recurrence at the operative site. There is no evidence of

Fig. 1 Radiograph of the feet demonstrates symmetrical great toe malformations.

Fig. 2 Computed tomography of the thoracic region demonstrates heterotopic ossification (arrow).
the efficacy of non-steroidal anti-inflammatory drugs (NSAIDs). However, considering the miserable outcome after surgical treatment alone, there was some possibility that NSAIDs could reduce the risk of recurrence in this particular case. The patient recovered without any recurrence or sequelae. We thought that it was important to reduce surgical trauma as much as possible during the operation. Minor trauma such as intramuscular injections, biopsy, mandibular blocks for dental work, and other blunt trauma from bumps, falls may initiate a focus of ossification.\textsuperscript{1,2} Disability related to bone formation is usually cumulative. Most patients with FOP are confined to a wheelchair by the third decade of life and require lifelong assistance in performing activities of daily life.\textsuperscript{2} The median age at the time of death for FOP patients is forty years. The most common cause of death is cardiovascular failure such as pneumonia and right-sided heart failure.\textsuperscript{6} In spite of short term follow up, we successfully treated this FOP child with surgical resection combined with NSAIDs.

\textbf{References}