Awareness of Heterotopic Ossification in Total Joint Arthroplasty: A Primer

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ABSTRACT

Heterotopic ossification (HO) is the presence of normal bone in soft tissue where bone should not exist. After direct musculoskeletal trauma of the surrounding soft tissue, HO is hypothesized to develop from a dysfunction of normal lamellar bone formation and remodeling that appears in nonskeletal areas of the body. Acquired HO related to total joint arthroplasty (TJA) of the hip and knee forms outside the joint capsule and can be a challenging condition when it impairs the essential healing process after elective surgery. Although HO is rare after elective TJA and thus clinically immaterial, when clinically relevant HO develops, patients may experience the following: 1) limited ambulation, 2) restricted range of motion, and 3) severe pain and discomfort that may lead to loss of function. Ultimately, patients with clinically relevant HO after elective TJA may require additional treatment, including medication, radiation therapy, manipulation under anesthesia, surgical excision of the HO, and possibly revision TJA. Awareness of HO and an understanding of the associated risk factors along with the various management options will enable health care practitioners and their patients to optimize their surgical outcomes.

INTRODUCTION

The goal of this article is to describe heterotopic ossification (HO) after total joint arthroplasty (TJA), its risk factors, and management, to increase awareness of this condition so that physicians can optimize their surgical outcomes. See the Sidebar: Advance Organizer Quiz to Retrieve, Use and Organize the Materials Presented in this Article.

HO is the presence of bone in soft tissue where bone does not normally exist. This condition develops from dysfunction of normal lamellar bone formation and remodeling (inhibition), which presents in areas of soft tissue (nonskeletal) in the body. All bone, including HO, has its own vascular supply of blood vessels. Because of the associated vascularity, HO bone can grow at 3 times the normal rate, causing destruction and pain in the joints. Mature HO shows cancellous bone growth (eg, trabecular or spongy, light, porous bone) enclosing numerous large spaces, as well as mature lamellar bone, blood vessels, and bone marrow with minimal production of normal blood cells.

TYPES OF HETEROTOPIC OSSIFICATION

The 4 types of HO are presented in Table 1. Of the 4 types described, acquired HO is most frequently observed and is the focus of this article. The 3 less common forms are 1) neurogenic HO, which can develop in patients with paraplegia after spinal cord injury; 2) genetic HO, such as myositis ossificans progressiva, a rare hereditary form of HO, which generally has a poor prognosis (most patients with this condition die early owing to related complications of restrictive lung disease and pneumonia); and 3) idiopathic HO, the causes of which remain unknown and ambiguous.

In direct musculoskeletal trauma, acquired HO may develop in patients with injuries related to fractures (eg, acetabular, dislocations), blast injuries, and burns. Similarly, soft-tissue trauma related to elective TJA might also lead to the acquired type of HO. HO after TJA of the hip and knee can be challenging because extra-articular heterotopic ossifications formed outside the joint capsule may impair the essential healing process necessary for a successful surgical outcome. Local trauma to soft tissue produced by TJA is hypothesized to disrupt the normal balance of bone formation and inhibition, possibly by inducing inflammatory dynamics needed to stimulate the production of HO: 1) osteogenic precursor cells, 2) inducing agents, and 3) a permissive soft-tissue environment. When normal lamellar bone develops pathologically in muscle, tendons, and other areas of soft tissue, this progression of HO may limit patients’ ambulation, reduce their range of motion, and, because of severe pain and discomfort, cause loss of function. Patients in whom clinically relevant HO develops may be subjected to additional treatment, including additional medication, radiation therapy, manipulation of the affected knee joint under anesthesia (MUA), surgical excision of the HO, and possibly revision TJA.

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<thead>
<tr>
<th>Table 1. Types of heterotopic ossification</th>
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<td>Type</td>
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<td>Neurogenic</td>
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<td>Idiopathic</td>
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TJA = total joint arthroplasty.

Keywords: clinically relevant heterotopic ossification, heterotopic ossification, joint stiffness, pathological bone growth, TJA, total joint arthroplasty

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therapy), can be considered to restore and preserve joint mobility and function. Surgical resection of HO is generally reserved for mature HO (recurrence and progression of HO can occur after “excision of” HO). In patients who underwent THA, MUA is not performed because of the risk of hip instability. In cases where these measures fail to produce optimal patient outcomes, revision TJA may be indicated.7

CONCLUSION

Despite the lack of consensus on standardized treatment guidelines for acquired HO established by the orthopedic community, various treatment options can be employed to possibly manage this condition. Health care professionals should be cognizant of and alert to the signs and symptoms of patients at risk of acquired HO, to ensure treatment optimization. ❖

Disclosure Statement

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How to Cite This Article


References