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ScienceDirect
Surgical Neurology 72 (2009) 747 – 751
SURGICAL NEUROLOGY
www.surgicalneurology-online.com

Spine

Implant design may influence delayed heterotopic ossification after total disk arthroplasty in lumbar spine

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Received 26 March 2009; accepted 10 April 2009

Abstract

Background: As total disk arthroplasty (TDA) gains increasing acceptance as an alternative to fusion for degenerative disk disease of the lumbar spine, new complications are encountered by the physicians during and after the procedure. We hereby report a complication after TDA in the lumbar spine that is in variance from previously proposed theories and suggests the possibility of implant design as one of the etiologic factors. The purpose of the present submission is to report a case of delayed heterotopic ossification (HO) after TDA that suggests that the keel-based design of the implant might have contributed to the etiology.

Case Description: The patient underwent TDA for L3-4 degenerative disk disease and had fusion surgery for L5-S1 disease about 6 months later. During follow-up, development of significant HO was noticed at the L3 and L4 level. Radiologic studies revealed the origin of HO to be the keel cut made in the body of L3 to accommodate the keel-based artificial disk.

Conclusion: The exact etiology of HO after TDA is not clear. The presented anecdote points toward vertebral body trauma due to the design of the implant as a possible factor that needs to be studied more elaborately.

Keywords: Lumbar spine; Total disk arthroplasty; Keel cut; Heterotopic ossification

1. Introduction

Total disk arthroplasty (TDA) is increasingly being advocated as a safe and effective alternative to the more conventional interbody fusion surgery in the treatment of lumbar degenerative disk disease. Several lumbar artificial disks have been approved by the US Food and Drug Administration in recent years, and longer term follow-up results for them have been published [2,4]. Heterotopic ossification (HO) has been consistently noticed as one of the potential complications of the lumbar disk replacement surgery with the incidence of 1% to 2% [5,8]. The etiology of this phenomenon has not been elaborated because of infrequent occurrence as well as relatively low clinical relevance. We hereby report a case of HO after TDA in the lumbar spine that is in variance from previously proposed theories and suggests the possibility of implant design as one of the etiologic factors.

2. Case report

A 52-year-old right-handed white male presented to us with symptomatic L3-4 herniated nucleus pulposus (HNP) that failed to respond to 6 months of conservative treatments. He had no significant medical history but admitted to

Abbreviation: ALIF, Anterior lumbar interbody fusion; CT, computerized tomography; HNP, herniated nucleus pulposus; HO, heterotrophic ossification; MRI, magnetic resonance imaging; PEEK, poly-ethyl-ether-ketone; TDA, total disk arthroplasty.

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0090-3019/$ – see front matter © 2009 Elsevier Inc. All rights reserved.
doi:10.1016/j.surneu.2009.04.009

smoking one pack of cigarettes per day for the past 28 years. Provocative discography was concordant with magnetic resonance imaging (MRI) findings of L3-4 disk herniation. He received a Prodisc II® artificial disk at L3-4 with the aim to preserve motion at the level. He continued to have satisfactory clinical and radiologic follow-up for 6 months after the procedure (Fig. 1A and B).

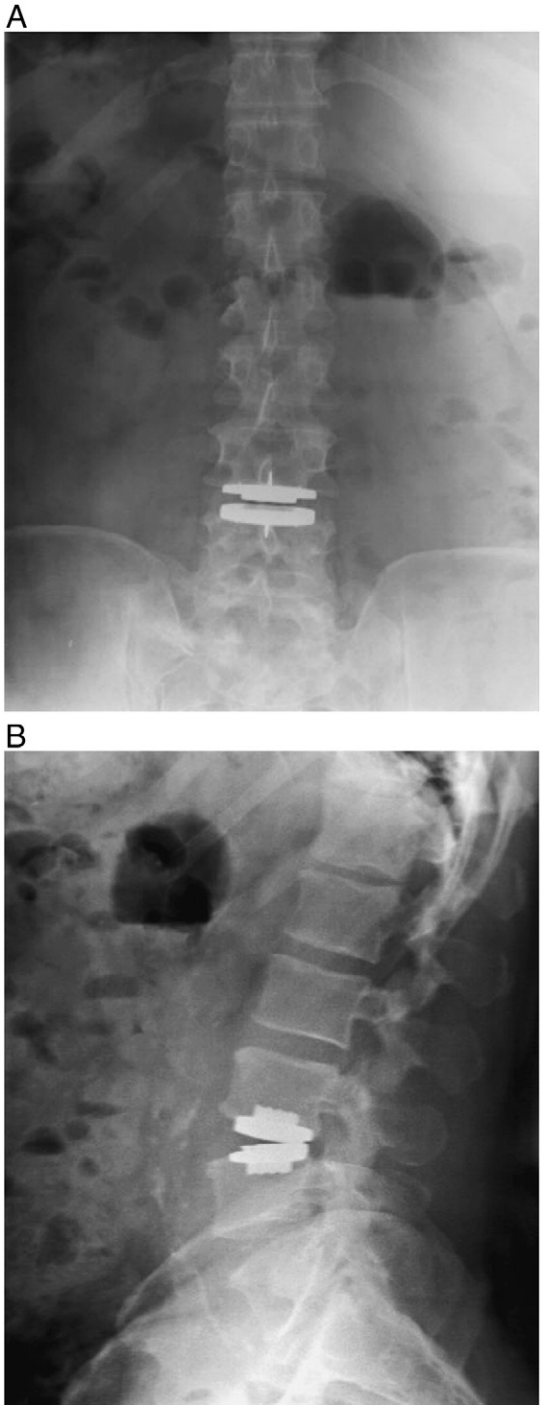

Fig. 1. Plain radiographs of lumbar spine in anteroposterior (A) and lateral (B) views 6 months after TDA.

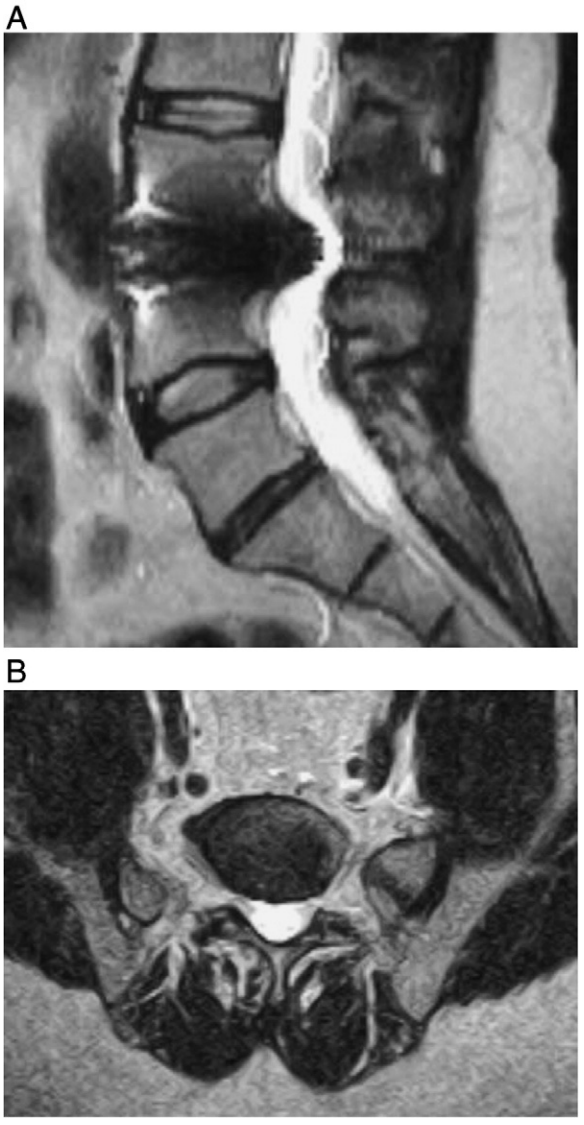

Fig. 2. T2-weighted MRI of the lumbar spine in sagittal (A) and axial (B) showing disk degeneration and annular tear at L5-S1.

He returned in the clinic about 7 months after the surgery with increased back pain and clinical signs and symptoms indicative of L5 radiculopathy. Magnetic resonance imaging of the lumbar spine was repeated with particular focus on lower (L4-S2) levels. The imaging revealed disk degeneration and annular tear and at the posterior aspect of L5-S1 intervertebral disk (Fig. 2A and B). After failed conservative treatment with medication, physical therapy, and 2 transforaminal epidural-selective L5 nerve root steroid injections, L5-S1 anterior lumbar interbody fusion (ALIF) was performed uneventfully using 12-mm poly-ethyl-ether-ketone (PEEK) interbody cage and 21-mm ALIF plate with 30-mm screws. Bone morphogenic protein or any other osteoinductive agents were not used during the fusion procedure, and the patient was not prescribed the use of postoperative bone growth stimulators as per the operating surgeon's standard practice.