

Kummell's Disease

Subjects: Orthopedics

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KD is an eponym for a delayed post-traumatic bone osteonecrosis. Patients usually present with advanced stage kyphosis in the thoracolumbar (T-L) area within months to years after experiencing a minor trauma, initially presenting without any symptoms. Possible causes include avascular osteonecrosis, microfracture, atrophic nonunion, and a nutritional injury fracture.

Keywords: Kummell's disease ; intravertebral vacuum cleft ; vertebral body collapse ; vertebral osteonecrosis ; surgical treatment

1. Introduction

Current literature states that the incidence of KD is around 7% to 37% in elderly individuals. The population in developed countries is aging and KD is a potential complication in up to one-third of OVCFs, which requires discussing an appropriate therapeutic approach for these patients ^{[1][2][3][4][5][6][7][8][9][10][11][12][13][14]}. KD usually affects the lower thoracic or upper lumbar region of the spine and it usually involves only a single vertebra ^[15]. The majority of injuries remain asymptomatic.

In the female age range of 50 to 54 around 10% of the patients suffered from at least 1 OVCF, but after the age of 80 statistics revealed a sudden spike to 50%. This analysis emphasizes a big role of prophylactic measures, watchful waiting, and the observation in an aging population that is at risk of osteoporosis or one with an OVCF. Prophylaxis should be implemented to minimize the prevalence of altered healing, nonunion, intravertebral vacuum clefts (IVC), and the most emerging and dangerous complication of vertebral fractures that is KD. These complications reduce the patient's quality of life (QoL) and therefore require adequate preventive measures.

2. Epidemiology

However elderly patients with multiple comorbidities and a decreased BMD are at an even greater risk ^[16]. Whenever fractures fail to fuse, the patient's pain increases, the QoL decreases, and even neurological deficits can occur. Current literature provides us with the evidence that justifies the use of radiological studies as a predictor of delayed union ^{[17][18]} ^[19]. In their prospective cohort study from 2020 proposed the following radiological risk factors for nonunion 12 months after an OVCF: (1) a middle column

Additional risk factors are: the female sex, having a low body mass index (BMI), smoking, a sedentary lifestyle, low calcium intake, and frequent falls ^[16].

3. Risk Factors

Osteoporosis is the biggest risk factor for KD, hence its high frequency in the affected patient population. Osteoporosis is found in more than 20% of the population over 50 years of age and appears more often in slim white females ^[20].

The idiopathic origin of KD may be due to drug cytotoxicity, avascular necrosis, and decreased intraosseous blood flow ^[21].

Post-traumatic avascular necrosis is the most frequent factor causing decreased blood supply to the bone marrow. Any damage that can obstruct the vessel supplying the vertebral body can lead to non-healing and osteonecrosis.

There are a variety of conditions that can obstruct the artery lumen supporting the spine: sickle cell crisis, Gaucher's disease, Caisson disease, SLE, prothrombotic states, pancreatitis, lipolytic enzymes, fluid overload, dyslipidemia, leukemia, lymphoma, diabetes mellitus, sarcoidosis, cirrhosis, hyperuricemia, malignancies, prolonged corticosteroid use (at least 5 mg per day over a period of 3 months), and alcohol abuse ^{[22][23]}.

4. Treatment

Because the majority of OVCFs are type A or type B, the aforementioned scales primarily point towards conservative treatment, with the greatest focus being on the maintenance of the patient's health when the disease is not significantly advanced [24]. Jang J.S. et al. and Stallenberg B. et al. established that patients with OVCFs with nonunion and back pain with or without symptoms of neurogenic compression are candidates for surgical stabilization [25][26]. Studies consistently show that up to a third of the patients will unfortunately not respond successfully to conservative therapy alone when dealing with OVCFs [27]. Even though patients with KD are elderly and suffer from multiple comorbidities, MIS reduces iatrogenic tissue trauma due to smaller incisions, decreases soft tissue damage and blood loss, and reduces muscular and ligamentous rupture.

Over-the-counter pain medications are often effective in pain management, but they do not facilitate the healing process. Therefore, bone-strengthening drugs such as bisphosphonates and hormone replacement therapy may be prescribed to stabilize and restore the bone density [28]. Reducing the range of motion (ROM) with a back brace helps in weight-bearing and decreases postural flexion. Nevertheless as shown in **Figure 1**, it is controversial whether bracing is effective in the treatment of spinal injury and if it provides better outcomes [29].



Figure 1. Images (from the left a X-ray and a CT scan respectively) of a vertebra injured from OVCF after conservative treatment failure.

The usual adverse effects of pharmaceuticals used by patients with KD that affect the central nervous system can lead to cognitive impairment, sedation, and constipation, especially in elderly patients. NSAIDs and acetaminophen use causes gastritis, gastric ulcers, hepatic and renal problems; especially in large doses, which can eventually lead to the worsening of the overall condition of the patient. The lack of physical activity can also lead to an impaired cardiovascular system and pulmonary function results [30]. There are not that many studies that clearly mention the complications of conservative therapy, but many physicians concur that patients using back brace are prone to back muscle atrophy, as stated by Mazanes D. et al.

The decision to perform surgery in order to improve the patient's condition and to prevent further deterioration of the patient's health is made in the following events: conservative management is ineffective; there are neurological complications; there is pain limiting the patient's ROM; and when there is a significant degree of kyphosis and neurogenic claudication [31]. In a majority of the cases, surgery is chosen [32]. MIS is less traumatic than conventional open surgery, potentially resulting in a faster recovery while providing similar clinical mid to long-term results. Bone cement-augmented pedicle screw fixation and the SJ system are other options for restoring spinal stability, alleviating debilitating pain, and improving clinical outcomes [33].

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