HALLUX RIGIDUS: A CASE REPORT OF SUCCESSFUL CHIROPRACTIC MANAGEMENT AND REVIEW OF THE LITERATURE

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ABSTRACT

Objective: To describe a common musculoskeletal disorder from a chiropractic management prospective, subsequently to stimulate further research into the chiropractic therapeutic effects on such cases and to contribute to chiropractic literature.

Clinical Features: A 27-year-old, 76" male student often involved in athletic activities, had a sudden onset of continuous localized pain in the medial aspect of the mid and forefoot on the right side for 1-and-a half months. The onset of pain was related to an accidental injury while playing basketball. The pain worsened every time during and after playing basketball and other weight-bearing activities such as walking upstairs and is palliated with physical rest. He tried Biofreeze and ice application for several times immediately after the injuries which help to some extent to relieve pain and swelling, but he did not seek any other professional care. The condition had been improving slowly even before he came to the clinic although the patient described the pain as 5/10 on the Borg pain scale when he came to the clinic for the first time. The characteristic local findings were a mildly hyper-pronated right foot, mildly asymmetric soft-tissue and bony contours, tenderness, stiffness and decreased range of motion (ROM) at the first metatarsophalangeal and adjacent joints on the medial aspect of the midfoot decreased fluid motions in the concerned joints on the chiropractic evaluation and some abnormal wearing in the shoes.

Intervention and Outcome: He was managed with chiropractic manipulation combined with other conservative measures. Range of motion (ROM), Borg Pain Scale and an orthopedic test (Morton's Test) were used as the outcome measures. The subject showed a favorable response to the conservative (chiropractic) care.

Conclusion: Although hallux rigidus is one of the most common musculoskeletal degenerative conditions, our conservative management received a favorable response but there has been

little discussion about it in chiropractic literature. It can be hypothesized that the progress of Hallux Rigidus (HR) can be reversed or halted by chiropractic management provided it is started at the early stage of the disease. (*J Chiropr Med* 2004;3:6-11)

Key Words: Hallux Rigidus; Degenerative Joint Disease; First Metatarsophalangeal Disorders; Chiropractic Manipulation; Rehabilitation

INTRODUCTION

Hallux Rigidus (HR) is the most common degenerative arthritis of the foot, affecting about 2% of the population between 30 and 60 years and is the second most common complaint in the great toe next to hallux valgus (HV) as well as a common disorder in young athletes. It was initially described by Davies, Colley and Cotterill in 1887 (1). It is a premature degenerative arthritis of secondary type, in terms of etiology [ie, secondary osteoarthritis (OA)]. This is a typical case of HR, but the response to conservative care proved to be quite successful and chiropractic manipulation was the mainstay in the conservative management of the case.

Despite the increasing incidences of these kinds of lesions in the athlete and associated considerable disability, this common foot disorder has received little attention in sports medicine. HR disability is greater than that seen with HV (2). It is a degenerative arthritis of the first metatarsophalangeal (MTP) joint (3). In practice, OA in the toes has commonly been seen only in the MTP joint of the great toe. Occasionally, the MTP joint of the smaller toes is affected; in that case it is called Freiberg's disease (4).

In a majority of the cases, HR is preceded by some form of physical trauma to the first MTP joint and the patient may or may not remember the incident. Anatomically, HR involves the periosteum, synovium, the joint capsule and subchondral bone (4,5). It develops as an isolated disorder or may occur in association with other disorder(s) of adjacent regions (as is our case).

The cardinal clinical features consist of somewhat localized pain in the medio-dorsal aspect of the first MTP joint, decreased ROM and stiffness at the joint. Plain radiography is almost always sufficient to investigate the condition. It may be confused with a few other local conditions, such as gout, turf toe, HV and sprain. The main concern is possibility of developing chronic pain syndrome.

Literature suggests that conservative therapy should be tried first for a period of time and surgical treatment should be tried only with certain definitive indications, such as the failure of conservative measures or the advanced stage of the disorder. There have been controversies about what specific surgical treatment or which surgical technique is appropriate.

The literature on HR is devoid of a discussion about chiropractic management of the condition, although chiropractic has a relatively long tradition of incorporating rehabilitation with it to treat many other disorders. Chiropractic manipulation and active rehabilitation techniques are sometimes used together, and therefore the impact of the combination of these 2 treatments should be reported (6) while studying musculoskeletal disorders.

CASE REPORT

A 27-year-old, 76" male student often involved in athletic activities, had a sudden onset of continuous localized pain in the medial aspect of the mid and forefoot on the right side for 1-and-a half months. The onset of pain was related to an accidental injury while playing basketball. The pain worsened every time during and after playing basketball and other weight-bearing activities such as walking upstairs and was palliated with physical rest. He tried Biofreeze and ice application several times immediately after the injuries which helped to some extent to relieve pain and swelling, but he did not seek any other professional care. The condition had been improving slowly even before he came to the clinic although the patient described the pain as 5/10 on the Borg pain scale when he came to the clinic for the first time. The characteristic local findings were a mildly hyper-pronated right foot, mildly asymmetric soft-tissue and bony contours, tenderness, stiffness and decreased range of motion (ROM) at the first metatarsophalangeal and adjacent joints on the medial aspect of the midfoot decreased fluid motions in the concerned joints on the chiropractic evaluation and some abnormal wearing in the shoes.

The patient also reported about the right elbow pain that started about 1-and-a half years ago, immediately

after playing basketball. The patient did not seek any kind of treatment other than the use of ice, compressions and several applications of Biofreeze. But, his current and main concern was the "right forefoot pain." This forefoot pain was about 9/10 on the Borg Pain Scale at the very beginning and slowly decreased thereafter, to a 5/10 when he presented to the clinic. The patient history included right knee and ankle sprain associated with roller skating 15 years ago, but currently he does not have any related symptoms and signs. He is lactose intolerant. His paternal grandmother had arthritis. The rest of the history is unremarkable.

Examination

Vitals were intact and general physical examination was unremarkable. Ophthalmologic exam revealed left ptosis and exophthalmos. Oral exam revealed a left deviated uvula. Systemic, chiropractic and orthopedic surveys were unremarkable. Local exam of the right ankle and the foot revealed a long, narrow and mildly hyper-pronated right foot; mild asymmetry in bony and soft-tissue contours in the first MTP joints, adjacent intertarsal (IT) and tarso-metatarsal (TMT) joints on the medio-dorsal side, where tenderness was also revealed. There was mild stiffness in the first MTP and adjacent joints, symmetric active ROM in first MTP joints on both sides, but restricted passive ROM on the right and mildly hypermobile first interphalangeal (IP) joint on the right. The shoes the patient was wearing at that time of evaluation were big and long, but relatively narrow with excessive wearing on the outer side of the right heel, posterior half of the sole and under the terminal phalanx of the great toe. On the left, there were normal pattern of wearing. The only orthopedic tests we employed on the forefoot was Morton's test, which was positive for metatarsalgia, and Helbing's test for foot pronation, which was also positive on the right side. Chiropractic evaluation of the areas of concern revealed decrease fluids motions in the MTP, TMT and IT joints.

Clinical Diagnosis

Based upon the clinical data synthesis, we arrived at the conclusion that the patient was suffering from HR and an unspecified joint problem in the adjacent joints. But, our focus was on the area of complaint. We concluded that it was likely a case of "secondary osteoarthritis" of the first MTP joint, which is termed HR.

Ancillary Investigation

We decided to take a series of plain film radiographs of the foot; AP, medial oblique and lateral projections were performed, which revealed moderate degenerative

changes in the first TMT joint along with that of the talonavicular and cuneonavicular joints. The radiograph also displayed pars peronea (sesamoid) and Morton's toe (long second ray) and osteophytes at the base the first metatarsal. Thus, the radiographs revealed a diffuse degenerative process in the mid and forefoot on the right side. However, they did not reveal any degenerative changes in the area of main complaint (ie, the first MTP joint) itself. Thus, we had a diagnostic challenge although there were clinical and biomechanical changes to support our diagnosis of HR.

Outcome Measures

Borg pain scale, visualized ROM and Morton's test were used to measure the outcomes of the treatment. We did not use plain radiographs as an outcome measure because of our short follow-up time.

Intervention

The patient had 7 clinic visits over a period of 8 weeks. He was seen for the first time on June 2, 2003 and the last visit was on August 1, 2003. We employed chiropractic manipulative therapy (CMT), mobilization, rehabilitation and nutritional supplements. Based upon the clinical and radiographic findings, we delivered chiropractic manipulation to the affected joints mentioned above with our main focus on the first MTP joint on each visit; however, no CMT was given on the fifth and subsequent visits. The 5th to 7th visits were actually used to manage his elbow joint problem; however, we also utilized them to re-evaluate the HR. We mobilized the joints in question before delivering the CMT each time. As a part of our rehabilitation program, we advised him to avoid the high heeled and narrow toe-box shoes. We recommended a passive stretching home exercise program for the involved joints in anterior to posterior, posterior to anterior directions and in rotational gliding motions to practice 3 times a day with the mention of the duration and frequencies for each motion (ie, 3 to 5 times for 10 seconds in each direction) throughout the course of the treatment and to continue for another 2 months or longer. The patient was also recommended nutritional supplements for 2 weeks. One of them was Bromelian (500 mg. orally, 3 times a day) and the other one was Glucosamine Sulphate (500 mg. orally, 3 times a day). We then advised the patient to restart any athletic and weight-bearing activities only when he did not feel the pain and stop them at the point when he began to feel pain again.

Outcome

On the very first visit, the intensity of pain was 5/10 on the Borg Pain Scale. On the second visit after the first

treatment, the pain was reduced to 1/10. Now, the patient started playing basketball again which caused his pain level to go up to 3/10 on the 3rd visit. On the 4th visit, it scaled down between 0/10 and 1/10. On the 5th, 6th and 7th (last) visits even with weight-bearing activities. ROM was estimated visually by passive flexion and extension and an assisted active movement of the first MTP joint relative to weight-bearing surface when the patient was seated, both at the time of initial diagnosis and on subsequent visits. The ROM was, therefore, not scrutinized with goniometric measurement in this patient. On the first visit, active and passive ROM in flexion and extension was limited to about 40°. On the second visit, only extension of the first MTP joint was restricted to about 60°. On the third visit, the ROM was almost normal (ie, 80°) and on the fourth to the last visits the full ROM was maintained. Morton's test was positive on the initial 2 visits and it reproduced slight pain on the third visit, minimal pain on the fourth and subsequent visits. As the duration of management was relatively short, we could not utilize radiographs as an outcome measure tool on our patient.

DISCUSSION

Background

HR is a secondary degenerative arthritis of the first MTP joint. It may develop in any age, but is most common in 3rd and 4th decades (7). It is common in adults, but occurs in children only very occasionally and has equal gender incidence in adults (8). It has become a significant concern of athletes, coaches and physicians (2). Most of the literature concerning HR focuses on its operative treatment. In this discussion, we are interested in finding out what the outcomes from non-operative care were, emphasizing the patient's perspective. The information could be used to gain better understanding of the natural history of HR. Lawrence provides a little information about conservative care of this condition (9). However, he is reserved about using chiropractic manipulation for HR.

The uniqueness of this case report is that it discusses a challenging condition and the application of the systematic and specific CMT in combination with rehabilitation employed to solve this purely biomechanical disorder with the goal of restoring structural and functional integrity, curtailing chronic physical disability and maintaining patient independence. A longer duration of follow up would be ideal (eg, 3, 6 or 12 months). Prognosis seems to be excellent, acknowledging that the patient may need occasional or infrequent chiropractic

manipulation and rehabilitation, provided he does not get re-injured.

Etiology

Literature on HR discusses a great deal about the etiology of HR. The causative factors can be classified as the following-

1. *Primary etiological factors (ie, precipitating factors)-*
 - Physical trauma to the first MTP joint [eg, hyper-extension injury of the first MTP joint] (8). Our case is related to this factor.
 - Ischemia (eg, osteochondritis dessicans of the joint surfaces) (8)
 - An effect of a systemic disease (eg, generalized rheumatoid arthritis) (8)
 - Local infection in the joint
2. *Secondary etiological factors (ie, predisposing factors)-*
 - Pronation of the foot (9)
 - Improper shoes (eg, shoes with narrow toe box) (10)
 - Interposed sesamoid bones between the phalanx and first metatarsal (10)
 - Age-most common between 3rd and 4th decades of life (ie, physically the most active period) (7)
 - Disorders of the proximal parts of the lower limb (eg, ankle hip, knee injury, short leg or spinal disorder) (10)
 - Habitual activities involving uncoordinated muscular actions (eg, neurogenic arthropathy (10)
 - Maldeveloped foot (eg, long and narrow foot). This condition may have some hereditary links (10)
 - Gait abnormality due to any cause (2)
 - Obesity (2)
 - Occupation (2)
 - Anatomical and biomechanical factors (eg, joints subject to compressive, shearing and frictional forces, including the first MTP joint) (10).

Pathogenesis

This is the similar to that in any other degenerative arthropathy. There may be wearing and tearing, avascularity and physical stress to the articular structures, consisting of the joint capsule, articular cartilage, synovium, periosteum and subchondral bone, due to the compressive, frictional and shearing forces to the joint (4). Any one of these processes may lead to inflammation in the synovium and resultant degenerative changes in the joint. The first MTP and other adjacent joints in the ankle and midfoot are all synovial joints and

are non weight-bearing joints, which are acted upon by the compressive and shearing forces (4,10).

Pathology

The pathological changes are similar to that in any other degenerative arthropathy. Pathological changes is dependent upon the involved structures, etiology and the duration of the condition. The periosteum and synovium demonstrate inflammatory response (ie, signs and symptoms of inflammation). Subchondral bone shows sclerosis (ie, osteophytes and eburnation), cartilage shows erosion (ie, loss of joint space) and joint capsule shows hyperplasia (ie, thickening) (4,10).

Clinical Features

The onset is usually insidious, but it may be sudden too. In our case, it was sudden in onset. The pain is aggravated by any weight-bearing activities, including walking upstairs, toe walking or rising on the toes, and is relieved by physical rest. The joint becomes stiff and there will be tenderness over the medio-dorsal aspect of the fore foot. There may be crepitus on the joint motion (3). There may be decreased ROM at the joint, usually to less than 30°. The interphalangeal joints may be hypermobile (8). There may be a bump on the top of the foot at the joint (ie, the first MTP joint is enlarged) and the great toe is held in a varying degrees of flexion (ie, hallux flexus). The metatarsal base may be pushed plantarward and its head may be tilted to the dorsum and callosity may be seen under the base of the first phalanx of the great toe (8).

There is a rare variant of HR, called hallux externus, in which the first metatarsus is plantar-flexed and the great toe is fixed in hyper-extension at the MTP joint (8).

There may be abnormal wear patterns in the shoe that the patient has been wearing and these shoe changes are suggestive of HR. The shoe itself may be narrow and relatively short. The outer side of the heel, posterior half of the sole and part of the sole under the terminal phalanx of the great toe demonstrate excessive wearing. The uppers are bulged outward over the outer side of the heel and the posterior half of the sole (8).

Dysesthesia may occur along the medio-dorsal hallux due to compression by shoes or stretching of the dorso-medial cutaneous nerve (8).

Clinical and Radiological Classification of HR

In 1999, Coughlin and Shurnas proposed a new classification of HR based upon clinical (ROM and pain intensity) and radiographic findings (12).

- Grade 0 – Dorsiflexion of 40–60°, absence of pain and presence of normal radiographic findings.
- Grade 1 – Dorsiflexion of 30–40°, presence of minimal pain and presence of dorsal osteophytes on plain radiographs.
- Grade 2 – Dorsiflexion of 10–30° presence of moderate pain and radiographs show dorsal, lateral and/or medial osteophytes, mild flattening of the first MTP joint, mild to moderate joint space narrowing and presence of sclerosis.
- Grade 3 – Dorsiflexion of <10°, often <10° plantarflexion, presence of constant moderate to severe pain, and plain radiographs show cysts, erosions, hypertrophied or irregular sesamoids, etc.
- Grade 4 – Stiff joints, presence of pain throughout the entire ROM and radiographs show loose bodies.

Ancillary Investigations

In majority of cases plain film radiographs are not enough to investigate a suspected case of HR. In the early stages, there may not be any radiographs findings or there may be just thickening of periarticular soft-tissues. There is no correlation between the subjective complaints and radiographic evidence of progression of HR as manifested by loss of the MTP joint space over time. In general, in mid-stage, radiographs may show a dorsal tilt of the first MT head and plantarward flexion of the base. There may be dorsal and marginal osteophytes in the related bones and joints and they may also be seen in adjacent regions as in the case in question. Late stages may show loss of joint space, sclerosis, joint irregularities and cysts (7,8,11). The literature does not recommend advanced imaging studies and lab studies.

Differential Diagnoses

Diagnosis of HR is based on the presence of pain and stiffness in the first MTP joint and physical findings of restricted joint motions, especially dorsiflexion (to <30°), increased joint bulk (due to capsular thickening, swelling and osteophytes) dorsally and associated synovitis (swelling, pain and tenderness) (2). However, the following conditions may confuse the clinical situation at times.

- Gout (recurrent episodes of acute attacks)
- Hallux Valgus (lateral angulation of the great toe)
- Turf toe (obvious history of injury and the injury occurs in hyper-extended position of the joint, pain on planter aspect of the joint).

Management

The treatment of HR ranges from conservative care to radical operations, depending upon the stage at presen-

tation, physician experience, patient age, availability of facilities and level of activities. The goals of the management should be pain alleviation, deformity correction and re-establishment of good joint motility.

Conservative measures are employed as a mainstay of therapy in the early stages and also as some adjunct measures in the other stage of HR. But, most of the literature concerning HR focuses on the operative management of the disease (11,12). Conservative management works best in early or uncomplicated stages (ie, grades 0 to 2). So, conservative management necessitates an early recognition of the condition. About 63% to 75% of the patients favor conservative approach. Mild cases do not require any treatment or may require symptomatic treatment at most. Therefore, conservative treatment is worth a trial first (4,7,11).

Most of the literature put the first emphasis on modification of the shoes the patient has been wearing, regardless the method of treatment. Modification of the shoes include shoes with wide toe-box, low heel, sole modified with steel shank or rocker bottom of metatarsal bar, to make the front portion of the sole stiff (to be fitted beneath the body of the MTP level). Also, it is recommended that the shoe should be larger than before and the leather should be softened dorsally over the MTP. The use of orthotics with medial stiff shank or bar is also helpful to correct pronation (4,8,9,11,12). The second important measure in conservative management in the modification of the patient activities that may include avoidance of situations that can lead to an extreme dorsiflexion of the great toe (eg, kneeling or squatting with toes) (12). Mobilization of the joint is a third important measure. CMT could be considered a mainstay in the conservation management of HR. The subluxation (in the medical sense) that can be present in HR may either be a cause or an effect of the condition. CMT is supposed to correct this subluxation. At this point, it would be a good idea to perform an evaluation and then deliver an adjustment to the adjacent joints too, as we did here, as per certain specific CMT techniques. Other conservative measures include passive stretching exercise to be practiced at home several times each day for a specified period, therapeutic ultrasound, electrical stimulation, nutritional supplements, some medicines (eg, NSAIDs, corticosteroids, etc), acupuncture, homeopathy, etc. Conservative measures may be tried for weeks to months before operative treatment is contemplated. A long-term follow up is better idea if conservative management is tried, for a period of 4 to 12 months.

Surgical management may be indicated in the following situations –

- An advanced HR with loss of joint space.
- Presence of a large dorsal metatarsal head osteophyte without significant pain (except with shoe pressures)
- Refractory cases to conservative treatment (11,12).

There are numerous surgical procedures to choose. The choice of surgical procedure depends upon the patient age, activity level of the patient, surgeon's preference, resources, etc. Procedures include dorsal cheilectomy, exisitional arthroplasty, capsular interpositional arthroplasty, arthrodesis, osteotomy, athroscopy, joint resection, etc. (12).

Complications

Although, HR is a non-life threatening clinical condition, it may lead to deformity and chronic pain condition.

Prognosis

HR may lead to deformity and chronic pain condition. Generally it is a manageable musculoskeletal disorder. Surgical procedures have some inherent limitations and potential complications.

CONCLUSION

HR is a one of the most common foot problems, occurring mainly during 3rd and 4th decades of life and has been a common concern of athletes, coaches and physicians. However, despite these realities, HR has received little attention in sports medicine and chiropractic literature.

HR develops as an isolated entity in majority of times, but it may also occur in association with other adjacent or systemic disorder. In our case, it was associated with degenerative disorder of the adjacent joints (eg, talonavicular, naviculocuneiform joints).

Conservative treatment is preferred by 63%–75% of the patients over operative treatment. Chiropractic management can play a significant role especially at the initial stages and chiropractic care can be incorporated with rehabilitative and some other conservative care measures (eg, therapeutic ultrasound, electrical stimulation, nutritional supplements, etc.) But, these treatments need to be substantiated by further studies, including comparative studies between allopathic and chiropractic management (6). Currently, most of the literature on

HR focuses on surgical treatment. But, there has been controversy as to what is the proper or ideal surgical treatment for HR and there are growing suggestions that further studies on the surgical procedures are needed (12).

This case report lacks a long term follow-up of the case. Although the case had a favorable response to our conservative care, we also did not pay much attention to the use of orthotics and shoes modification. The successful outcome of the case cannot be generalized.

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