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Case Report

Single US Guided HA Injection Reduced Hip Pain and Improved Function for 20 Months: A Case of Osteonecrosis

Asmaa Mahmoud Ali Moustafa[1,4]*, Andrea Massimiani[2], Francesco Oliva[3] and Calogero Foti[4]

[1]*Department of Physical Medicine, Rheumatology and Rehabilitation, Ain Shams University, Cairo, Egypt*

[2]*Department of Medicine and Surgery, Tor Vergata University, Rome, Italy*

[3]*Department of Orthopedic and Traumatology, Tor Vergata University, Rome, Italy*

[4]*Department of Clinical Sciences and Translational Medicine, Tor Vergata University, Rome, Italy*

Abstract

Hip Osteoarthritis (OA) and Osteonecrosis (ON) are two separate kinds of arthropathies; each has its distinct features regarding epidemiology, histopathology and radiographic findings. However both could be presented with similar arthritis-like symptoms, and may result in marked pain and disability which eventually ends with Total Hip Arthroplasty (THA). In this case report, we present a 67 years old male has hip ON with osteoarthritic component; surgery was a treatment option however, the patient described unexpected long term amelioration after single US guided Hylastan SGL80 injection upon his refusal to THA. Results showed continuous significant improvement in Visual Analogue Scale (VAS), McGill Pain Questionnaire (McGill), Western Ontario McMaster Questionnaire (WOMAC), Lequesne Index, and tenderness scale up to 20 months follow up, even in the presence of femoral head collapse. Hyaluronic acid (HA) could be a feasible option to treat painful osteonecrotic hip when THA is not applicable or refused by the patient.

Keywords: Femoral head collapse; Osteoarthritis; Ultrasound guided injection; Viscosupplementation

Background

Osteonecrosis (ON) is a disease characterized by the disruption of the normal bone vascular supply; it is a debilitating, painful, progressive, and refractory disease that has multiple etiologic risk factors. It is caused by bone cell death, which itself has various causes, leading to articular cartilage collapse and subsequent osteoarthritis [1]. ON is most frequently observed in the hip, followed by the knee, shoulder, and ankle [2]. Pain and poor function resulting from progressive femoral head collapse and osteoarthritis, could be severe enough to limit range of motion in the affected joint. In some cases, advanced disabling stages may develop and necessitate demanded Total Hip Arthroplasty (THA) [3].

In addition to THA and joint preserving procedures [4,5], non-operative management was described in literature [6], this includes drugs such as anticoagulants, bisphospohanates and vasodilators [7-10] or physical modalities as extra-corporeal shock wave treatment, pulsed electromagnetic therapy, and hyperbaric oxygen [11-13]. The results of these different treatment options vary according to diverse factors based on patient and lesion characteristics [14,15]. However the ultimate goal of all suggested treatments in ON management was the reservation of the involved hip with less concern to resolve the symptomatic problems secondary to the osteoarthritic component of the osteonecrotic hip.

Visco supplementation with exogenous Hyaluronic Acid (HA) has become lately one of the most widely used treatment in osteorthritis, it is suggested to be one of the best conservative therapy before surgery, acting on pain relief and function. There are few data about the use of HA in other hip disorders rather than osteoarthritis, with no definite evidence to prove its ability to modify the morphological structure of the pathological hip and the natural history of the disease. The most relevant evidence seems to show the utility of HA injections in improving synovial inflammation, with only a few studies have been conducted [16], the timing of treatment, the volume of the HA doses employed, and the correct indication for HA use, such as the more suitable phenotypes or stages of OA, especially for joints other than the knee, is still unclear, and controversial [17,18].

Here within we report a long term clinical improvement of 67 years old male with hip ON, that was maintained over a period of 20 months following single ultrasound guided injection of 4 ml Hylastan SGL-80.

Case Report

R.G. is a 67 years old male, retired manual worker, of average weight (body mass index 24.6 kg/m^2) with good general condition who had been under anti-glaucomatous treatment for about 14 years, clinical and radiographic diagnosis for right hip osteonecrosis was achieved before our encounter by 2 different orthopaedic surgeons, with controversy about the most suitable management; THA versus conservative therapy. Based on the patient preference he was referred to rehabilitation department in our institute for conservative treatment.

The patient described right hip pain (dominant hip) started January 2012 following dancing for long time in the previous night, the pain was of gradual onset, progressive course, partially improved with rest, later the pain worsened at the end of the day especially after prolonged weight bearing and climbing stairs. The patient declared that this pain was associated with stiffness and significant impairment of daily activities. Paracetamol was taken in case of pain exacerbation.

***Corresponding author:** Asmaa Mahmoud Ali Moustafa, Department of Physical Medicine, Rheumatology and Rehabilitation, Ain Shams University, Cairo, Egypt; Department of Clinical Sciences and Translational Medicine, Tor Vergata University, Rome, Italy, Tel : +20 1006415074; +39 8812935378; E- mail: dr.asmaa.mahmoud@hotmail.com; mhmsma01@uniroma2.it

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The physical examination revealed limited range of motion of the right hip in abduction, internal and external rotation with painful adduction and external rotation, tenderness was positive in anterior, posterior and lateral hip, antalgic gait was observed, spine and left hip joint evaluation was irrelevant, for radiological evaluations at baseline and 20 months post injection (see Table 1).

Radiological examination	Date	Findings
Baseline		
Plain X-ray	27-09-2012	Bilateral osteoarthritis with signs of a vascular necrosis of the proximal femoral epiphysis more evident on the right side.
MRI	25-01-2012	Reduction of articular space of right hip. Right femoral head has an area of hypo intense signal that becomes hyper intense on sequences merging with intra- and peri-articular fluid expressing reactive synovitis as signs of necrotic bone. Left femoral head shows vugs formation. With subchondral distress of acetabular roof bilaterally. No pathological changes in signal intensity of myotendinous structures at the site of interest.
20 months post-injection		
Plain X-ray	26-09-2014	Marked osteoarthritis, bone resorption of the femoral head with slight collapse of the upper bone profile, most probably osteonecrosis.
MRI	15-09-2014	Images were taken in axial and coronal planes using SE, TSE, TIRM sequences. The right femoral head is oval in shape, with signal alteration of the antero-medial side, (49 mm) heterogeneously hyperintense signal intensity on T2-weighted images and hypointense on T1-weighted images, bounded by sclerotic margin denoting avascular necrosis. Associated with cancellous bone edema. Concomittant intra-articular synovial reaction. Acetabular marginal osteophytic irregularities, with degenerative changes of labrum, joint space narrowing with thinning of articular hyaline cartilage. subcondral cysts are seen on both sides of the left joint with mild reactive synovitis

Table 1: Radiographic findings at baseline and 20 months after injection (as recognized by radiologists in the report).

*MRI; Magnetic Resonance Imaging

Our impression - based on the patient's history, clinical examination, and radiographic findings - was that the patient's symptoms arose directly from the degenerative osteoarthritic changes of the articular surface associated with right femoral head osteonecrosis.

After discussing the risks, benefits, and alternatives of treatment options, the patient chose to go for viscosupplimentation. Single ultrasound guided injection of 4 ml Hylastan SGL-80 was prescribed, to be followed by exercise program to improve hip Range of Motion (ROM) and muscle strength. Appointments for the procedure and follow up visits were fixed.

Method

Informed consent was obtained; the injection was accomplished using longitudinal antero-inferior approach under ultrasound guidance with linear probe 7.5-10 MHz. A 20-gauge, 3-1/2 inch needle was inserted 1 cm from the distal pole of the probe pointing toward the femoral neck with a tilt 45°, then pre-filled syringe of 4 ml of Hylastan SGL-80, was securely attached to the needle, after which the drug was injected slowly under real time imaging (Figure 1).

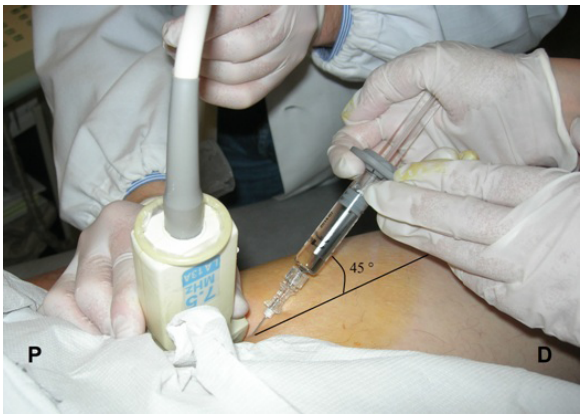

Figure 1: 4 ml of Hylastan SGL-80 injected under real time ultrasound guidance. P, Proximal; D, Distal.

The main outcome measures for assessment of the injection efficacy applied before and after injection were: Visual Analogue Scale (VAS), McGill Pain Questionnaire (McGill) and Western Ontario McMaster Questionnaire (WOMAC), Lequesne Index, and tenderness scale [19] that was considered positive if at least one side of the hip joint - anterior, lateral or posterior - is tender on palpation. Patient was followed 1 month, 3, 6, 12, 18, and 20 months post-injection (T1, T2, T3, T4, T5, T6 respectively).

Results

Although the patient was not committed to the prescribed exercise program through the whole duration of the follow up, satisfactory improvement was obtained as soon as the 1st visit -1 month after injection- and maintained till the 6th visit 20 months post injection. Over this period patient was on his routine daily activities with no instructions given for weight bearing restrictions, except avoiding prolonged standing and swimming was recommended instead of running and jumping for sports.

The percentage of the change in applied scales was calculated and compared to baseline (T0), results revealed significant clinical improvement in all time points with observation of complete absence of hip pain at 6 and 12 months post injection as measured by VAS and McGill (Table 2), the trend of improvement toward T6 showed ups and downs without reaching to baseline values in any of the scales except VAS at T1 and T5 (Figure 2). Clinical evaluation compared to first assessment described before, showed pain-free ROM with partial improvement regarding the limitation of internal/external rotation and abduction over the time points from T2 till T6, absence of limping and joint tenderness on palpation in all time points since one month till 20 months after injection.

Discussion

Currently there are various conservative measures suggested for treatment of ON of the adult hip [7-13], however the evidence in literature is weak to support their effectiveness in preventing disease progression [20]. A recent review stated that the evidence regarding the conservative treatments for ON is insufficient to make recommendations of any kind, and it can be only considered to gain time to surgery

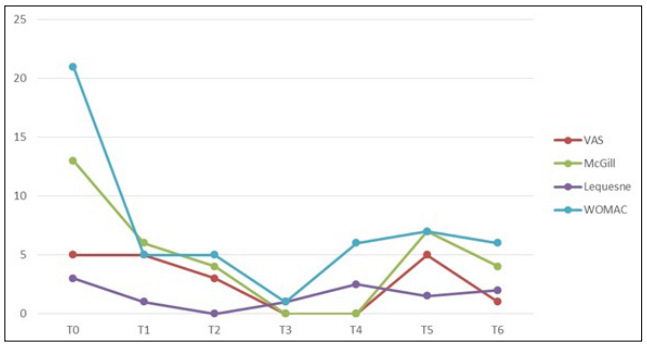

Figure 2: Trend of improvement of outcome measures from baseline till 20 months post-injection (T0-T6), without reaching to baseline values in any of the scales except VAS at T1 and T5. With complete absence of hip pain at 6 and 12 months post injection, VAS, Visual Analogue Scale; McGill, McGill Pain Questionnaire; WOMAC, Western Ontario McMaster Questionnaire.

Scales	T0	T1	T0/T1%	T2	T0/T2%	T3	T0/T3%	T4	T0/T4%	T5	T0/T5%	T6	T0/T6%
VAS	5	5	0	3	-40	0	-100	0	-100	5	0	1	-80
McGill	13	6	-54	4	-69	0	-100	0	-100	9	-31	4	-69
Lequesne	3	1	-67	0	-100	1	-67	2.5	-17	1.5	-50	2	-33
WOMAC	21	5	-76	5	-76	1	-95	8	-62	8	-62	6	-71

Table 2: Scales and clinical evaluation at baseline (T0), 1, 3, 6, 12, 18, 20 months post injection (T1, T2, T3, T4, T5, T6 respectively).

*VAS: Visual Analogue Scale

*McGill: McGill Pain Questionnaire

*WOMAC: Western Ontario McMaster Questionnaire

while keeping in mind that the natural course of the disease will not be altered [21].

Among these conservative measures, supplementation of hyaluronic acid was not suggested as a treatment option, instead it is mentioned in literature as the main endogenous component of the extracellular matrix in ischemic necrosis, with suggestions that quantity analysis of HA can be used as a good indicator in early diagnosis and prognosis of femoral head ON [22,23].

HA injection in hip disorders rather than OA was reviewed using various combinations of key words and mesh terms including: hyaluronic acid, hyaluronic injections, hip joint, hip osteoarthritis, hip diseases, rheumatoid arthritis, femoral head avascular necrosis, hip dysplasia, femoroacetabular impingement, hip disorders, hip cartilage, conservative treatment. No studies identified about HA efficacy in femoral head avascular necrosis [16].

In spite of the long term improvement in the pain and function of the treated hip in our case, the HA effect in protecting the femoral head from collapse cannot be assumed. Nothing was found in literature in this regard and to the best of our knowledge no study has tested HA injection as one of conservative modalities in hip ON. On the other hand, Osteonecrosis of the femoral head often results in secondary osteoarthritis of the hip joint [24]; the maintained amelioration in our case after single HA injection could be through improving the physiological environment of the associated osteoarthritic changes by restoring the protective viscoelasticity of synovial fluid [25,26], which possibly was the main source of patients` pain and dysfunction rather than the Osteonecrotic process itself.

Our results gives a chance for HA to be suggested as an option for effective symptomatic treatment in hip ON specially when THA is refused by the patient, not applicable or needed to be postponed. Literature is missing clear information about its safety and efficacy in such cases. Randomized controlled trials are required to investigate the impact of HA Intra-articular injection on hip disruption in different stages of femoral necrosis, while the ability of the external HA supplementation to substitute the degraded HA in the necrotic bone is a matter of discussion.

Conclusion

Viscosupplementation is increasingly being used in management of osteoarthritis, our case of osteonecrotic hip reported satisfactory clinical improvement over a period of 20 months after single HA injection. If surgical intervention was not applicable, hyaluronic acid injection could be considered as an option for symptomatic treatment of femoral head ON with secondary osteoarthritis. Further investigations are necessary to obtain firm evidence about the efficacy and safety of hyaluronic acid injection in treatment of hip osteonecrosis. The ability of the external HA supplementation to substitute the degraded HA in the necrotic bone is recommended to be a topic for advanced research.

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