



CONSERVATIVE TREATMENT IN AVASCULAR NECROSIS WITH EXERCISES – AN EVIDENCE BASED CASE STUDY

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ABSTRACT

Introduction: Osteonecrosis of the femoral head (ONFH) is a disabling condition that affects mainly younger subjects in the midst of their working lives; Most of the subjects with Avascular Necrosis were treated with Total Hip Replacement. **Aim and Objectives:** The aim and objectives of this case study report was to analyse reduction in obesity and its effect on a subject with Avascular Necrosis. To evaluate clinical and subjective impact with exercises on this subject. **Materials and Methodology:** Treated with exercises for his obesity and orthopaedic complaints with a frequency of two sessions a week from October 2016 to January 2017. Each session lasts for 25 - 30 minutes. The intensity of the exercises were at 60% - 70% of the maximal heart rate. **Results:** There is reduction in obesity with lowering of waist circumference and Hip Outcome Score ($p < 0.001$) as evidenced highly statistically following exercises. **Conclusion:** This innovative study of conservative physiotherapeutic management of an Avascular Necrosis subject gives a ray of hope, where reduction of obesity and application of various physiotherapy techniques not only shows clinical betterment but enhances functional activities of the subject.

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INTRODUCTION

- Osteonecrosis of the femoral head (ONFH) is a disabling condition that affects mainly younger subjects in the midst of their working lives; to this day, it has remained a devastating disease. It affects both hips in more than 60% of individuals and is being diagnosed with increasing frequency (Philippe Hernigou, 2009).
- Patients are pain free during the ischemic episode. The occult, avascular necrosis of the femoral head may be present for more than 5 years before the onset of symptoms (Lieberman *et al*, 2003). Blood is supplied to the femoral head via a branch of the obturator artery that is conveyed across the intra articular space on the ligamentum teres or round ligament. Avascular necrosis accounts for 5% to 18% of total hip arthroplasties performed in the United States annually. (Dawn Colomb Lippa, 2014)
- Pathophysiology of osteonecrosis of the femoral head occurs through common pathway, which is decreased blood flow to the femoral head that leads to bone ischemia and death (J.Arlet 1992) vascular occlusion extrinsically compressed arteries and veins (Wang *et al* 2000) and in vasculitis, irradiation (Jones 2001)

- Bone marrow examination reveals necrosis of haematopoietic cells, endothelial cells and lipocytes, osteocytes atrophy and empty laminae become evident in time with surrounding viable bone may lose mass and become osteopenic from relative patient inactivity over the course of the disease (S. Day, pp. 372–375, M. J.Glimcher *et al*, 1979).

Prevalence of Avascular necrosis

Diana kamal (*et al* 2013) observed in their study an almost continuous increase in the number of patients admitted annually from 11 in 2007 to a total of 25 patients, in 2011. The most common causes in the United States are alcohol intake (20 – 40%), corticosteroid therapy (35 – 40%), heavy drinking (21.8%) and idiopathic causes (20 – 40%). (Aiello *et al*, 2011).

In a study from Japan there were 2500 – 3000 new cases of avascular necrosis of femoral head every year. The common causes were corticosteroids (34.7%), heavy drinking (21.8%) and idiopathic forms (37.1%) (Tofferi *et al*, 2012). In a retrospective study conducted in England in 2009, the estimated incidence of disease, between 1989 and 2003, was from 1.4 to 3 cases per 100000 inhabitants. The important risk factor is trauma. (Cooper *et al*, 2010)

In Central India, sickle cell disease has a very high prevalence and is the most common associated condition with

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osteonecrosis followed by alcohol abuse and corticosteroid use. (Sudhir S Babhulkar, 2003)

Aim and Objectives

The aim and objectives of this case study report was to analyse reduction in obesity and its influence on a subject with Avascular Necrosis.

To evaluate clinical and subjective impact with exercises on this subject.

Background Information

A male patient, aged 58 years serving as a faculty in an engineering college of Chennai, gives a medical history of fall in 2008 and was treated with valgization osteotomy with condylar blade plate fixation for right fracture head and neck of femur.

Complains of pain in the right hip with difficulty in walking since 7 years.

On Observation

- Limb length discrepancy.
- Atrophy of right gluteal and anterior thigh muscles.
- Ambulant with lumbar list to left.
- Right hip internally rotated and genu valgum.

On Examination

Limb length: Right lower extremity: 98cm

Left lower extremity: 101cm (3 cm shortening of limb length).

Cadence: 52/ minute.

Circumference of Qaudriceps: Left: 38 cm, Right 41 cm
Gastrocnemius: Left: 33.5cm; Right: 37.5cm (4 cm hypertrophy of the injury leg)

Range of motion of RIGHT HIP LEFT HIP
Flexion: 35* Flexion: 120*
Extension: 5* Extension: 35*
Abduction: 10* Abduction: 55*
Knee Joint: (Right side) Prone Lying (Left side)

Flexion:90* Extension:70* Flexion:0-120*
Extension:120-0*

Trendlenburg’s Sign Positive

Motor Power:	Right	Left
Hip Flexors:	3+/5	4+/5
Abductors:	3+/5	4+/5
Adductors:	3+/5	4/5
Extensors:	3+/5	4/5
Knee Flexors:	4/5	4+/5
Extensors:	4/5	4+/5
Spinal Extensors:	3/5	
Abdominal muscles:	3/5	

Anthropometric Measurements

Waist circumference: 106cm.

Provisional Diagnosis: Avascular Necrosis of Right Hip

MATERIALS AND METHODOLOGY

This subject was treated with exercises for his obesity and orthopaedic complaints since the last 3 months with a frequency of two sessions a week.

Each session lasts for 25 – 30 minutes. The intensity of the exercises were at 60% -70% of the maximal heart rate.

Treatment

Mobilisation exercises, Strengthening exercises, Closed kinematic exercises, Resisted exercises using physio ball.

Parameters were measured at the beginning, during October 2016 and at the end of 25 sessions in January 2017 the following parameters were analysed and tabulated and using due statistical means as below:

RESULTS

Table Results of Pre & Post Values of Waist Circumference, Hos for AVN

Test	Waist Circumference	Hos
Pre	106 cm	62 %
Post Physiotherapy	100 cm	37 %
Standard Deviation	2.45	4.58
Standard Error	1.41	2.64
‘t’ value	4.25	9.46
p value	< 0.001	<0.001

DISCUSSION

Limb length inequality where a differentiation must be made between the anatomical or structural short leg and the functional short leg (subotnick 1976). Structurally short limb is often compensated for by a functional adaptation on the long leg side including ankle pronation (langer 1976) can develop scoliosis (Eichler 1977)

Based on limb length inequality magnitude of discrepancy, this subject has (grade I) mild category (Reid and Smith 1985) and this category is associated with LBA and OA hip (Mc Shaw and Bates 1991). The pelvic tilt imposed by limb length inequality, may impose bilaterally unequal stresses in the hip and the knee joints during upright posture (Maquet 1984)

This study subject had an adapted lateral tilt and scoliosis with concavity to right was recorded in line with the above studies.

New Treatments in Physiotherapy

Modalities such as pulsed electromagnetic field stimulation was reported as a treatment method for avascular necrosis.

Extra corporeal shock wave therapy was used in the Europe by Wang (*et al* 2005) with 79% improved score; Reis (*et al* 2003) have demonstrated hyperbaric oxygen in the treatment of avascular necrosis.

Conservative management with protected weight bearing is not effective. This treatment will allow progression of their condition in one or two years. Before the onset of femoral head collapse, non - operative treatment includes the use of various electromagnetic, acoustic stimulation or pharmacologic agents. (Philippe Hernigou, 2009).

Eli peled has evaluated the influence of alendronate treatment on the rat femoral head shape after 6 weeks of daily treatment, when compared with controls. Alendronate treatment prevented the distortion and destruction of the femoral head. Osteoclasts inhibition might prolong the bone creeping substitution, which might reduce disability due to femoral head collapse. (Philippe Hernigou, 2009).

Proprioceptive Neuromuscular Facilitation (PNF): PNF was developed by Margaret Knott and Herman Kabat. Treatment involved re-education of developmental movements and postures. This approach helped patients become more efficient in their movements and activities of daily living. (Stretching - Exercises - Guide.com, 2007-2013).

“The effects of two stretching procedures on hip range of motion and gait economy” two stretching procedures (a) Static stretching and (b) Soft tissue mobilization with proprioceptive neuromuscular facilitation. Static procedures resulted in significant improvements in range of motion for hip extension and flexion. The STM/ PNF also resulted in significant improvements in hip extension and flexion range of motion. (Joseph J. Godges *et al*, 1989).

Obesity

Obesity is strongly associated with the need for a total joint replacement among adults less than 60 years old (S. Harms *et al*, 2006). Flugsrud (*et al*. 2002) showed an increasing relative risk with an increasing BMI, both in males and females.

A. Kulkarni (*et al*, 2011), found that obese patients who have bariatric surgery prior to having hip arthroplasty performed better than those who had hip arthroplasty first. This study where the subject was treated with resisted exercises using air inflated physio ball has shown an adequate reduction in obesity as evidenced by statistical analysis $p < 0.001$.

Studies against Non Operative Treatment Options of AVN

Patients diagnosed in the early stages (I and II) had benefited from a surgical procedure performed in order to save and to maintain the integrity of the femoral head, respectively decompression drilling. Patients diagnosed in the third and fourth evolutionary stage have not benefitted from other therapeutic means, in addition to the reconstruction of the femoral head, respectively hip arthroplasty. (Diana Kamal *et al*, 2013).

Studies In Favour of Non Operative Treatment Options of AVN

Five studies which advised reduced weight bearing with expectation of preventing femoral head collapse during the healing of osteonecrotic bone (Cheng *et al* 2004). However a meta analysis of 21 studies of non operative methods encompassing 819 avascular necrosis hips, 23 % of the hips had benefitted from restricted weight bearing modality while 76% have to be treated with hip arthroplasty (Mont *et al* 1996). According to Schoenstadt (2008), have recorded that range of motion exercises are helpful for maintaining joint function.

Wang *et al* 2000 had reported positive effects on AVN with lipid lowering agents. Glueck *et al* 1995 with anabolic steroids to decrease AVN symptoms with 1 year follow up.

Quality of Life

Need to optimize the quality of life among avascular necrosis where highlighted (Akinyoola *et al* 2009) in line with this study quality of life of this study subject has shown ($p < 0.001$) statistically highly significant progress as displayed in the results table.

Uniqueness of this study: with conservative physiotherapy management the subjects chances of undergoing surgery is delayed or postponed, perhaps continued longer, may avoid hip arthroplasty.

Limitations

Includes this original research being a case study report with no qualitative variables are included as tools of measurement.

Further recommendations

Large sample size of longer duration follow up are recommended. Other measurable parameters such as X ray , NMRI, are highly recommended.

CONCLUSION

This innovative study of conservative physiotherapeutic management of an Avascular Necrosis subject gives a ray of hope, where reduction of obesity and application of various physiotherapy techniques not only shows clinical betterment but enhances functional activities of the subject.

Thus the need for the subject to undergo arthroplasty was highly influenced in a significant positive note.

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