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Bone protective effects of estrogen hormone in knee osteoarthritic female patients

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Abstract

Osteoarthritis of knee joints is a disease of old age female sex. It is very common in post menopausal females. It is characterized by narrowing of space in joints due to inflammation. The exact mechanism of inflammation is not clear. The present study is being carried out in 150 female subject of age group 40-60 years suffering from osteoarthritis of knee joints and 50 normal healthy control female subjects of same age group. A correlation is made between TNF-α, IL-6 and estrogen hormone and found significant inverse correlation (< 0.001) between estrogen hormone and TNF-α, IL-6 in osteoarthritic female patients as compared to normal healthy control female age group. Estrogen hormone plays a bone protective effect of knee osteoarthritic disease.

Keywords: Estrogen hormone, TNF-α, IL-6

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Introduction

Osteoarthritis is one of the most common musculoskeletal disorders of elderly female subject. Osteoarthritis involves the entire synovial joint, encompassing the cartilage, synovium and underlying bone [1, 2]. The cells in each of these tissues have independent capacities to initiate and respond to injury in the joint, ultimately resulting in degeneration of cartilage. It has been reported that in the female severity of osteoarthritis could be prevented due to protective role of estrogen upto the time of menopause. It also act as a bone protective hormone in the female and these bone protective effects could be mediated by paracrine mechanism involving the non osteoclastic cell modulation of osteoclast formation and activity [3]. Such indirect action appears to decrease the levels of IL-6 and TNF-α in osteoarthritic female patients. Estrogen depletion after menopause or ovariectomy may activate TNF-α, IL-1 [4]. These finding suggest that TNF-α, IL-6 could mediate the loss of bone in estrogen deficiency in females [5]. Therefore the present work is being done to correlate estrogen hormone level TNF-α, IL-6 in females suffering from knee joint osteoarthritis.

Materials and Methods

The study was conducted (with institutional ethical committee approval) in 150 female patients suffering from knee osteoarthritis with age group of 40-60 years. They are clinically & radiological diagnosed osteoarthritis patients attending OPD of Orthopaedic department- J.A Group of Hospital, G.R. Medical College Gwalior (M.P.), for regular checkup. 50 normal healthy female control subjects of same age group have also been included in our study for statistical comparison.

5.0 ml of blood was collected from all the subjects in fasting condition and the serum was separated and stored as -20 ^{0}C until used. The estrogen hormones, TNF-α, IL-6 were estimated by EIA GEN estrodial kit, Duoset ELISA techniques, Accucyte ELISA development system and respectively in Biochemistry Department.

All estimation were done in duplicate and the mean value were calculated. The Student independent 't'test was used for the statistical analysis for the data.

The written consent were also taken from patients prior to study.

Result

In the knee osteoarthritic female subjects of age group 40-60 years, the status of TNF-α and IL-6 were found increased as compared to control group of females. In this group, the mean value of TNF-α (4.23± 0.98 ng/ml), and IL-6 (3.84± 1.01 ng/ml), indicate a significantly increased

(p< 0.001), as compared with control group of females [Table1].

In the mean value of estrogen hormone in knee osteoarthritic female subjects (26.98± 15.18 pg/ml), indicate a significantly decreased (p< 0.001), as compared to control group of females (37.03±19.98 pg/ml) [Table1]. In the knee osteoarthritic female subjects were found inverse correlation of estrogen hormone and TNF-α, IL-6(r<0.001) [Table2].

Table 1. *Status of estrogen hormone TNF-α and IL-6 in the female subjects.*

Study Group	Study Parameters	Estrogen Hormone(pg/ml)	TNF-α (ng/ml)	IL-6 (ng/ml)
Control Female group	MIN	10.78	0.98	0.94
n=50	MAX	85.94	1.98	1.87
	Mean ± SD	37.03 ± 19.98	1.53 ± 0.28	1.33 ± 0.23
	SE	2.82	0.04	0.03
knee osteoarthritic	MIN	9.18	2.12	2.01
female subjects	MAX	78.54	6.12	5.75
n=150	Mean ± SD	26.98 ± 15.18***	4.23 ± 0.98 ***	3.84 ± 1.01 ***
	SE	1.33	0.08	0.008

Value expresses as a (p <0.001)
**** Highly significant*

Table 2. *Correlation of estrogen hormone TNF-α and IL-6 in the osteoarthritic female subjects.*

Variable Parameters	Estrogen	TNF-α	IL-6
TNF-α	-0.40***	--	0.93***
IL-6	-0.35***	0.93***	--
Estrogen	--	-0.40***	-0.35***

Value expresses as a (r <0.001)
**** Highly significant*

Discussion

Osteoarthritis is a complex disease whose pathogenesis includes the contribution of biochemical and metabolic factors altering homeostasis of articular cartilage and subchondrial bone. [6]. During osteoarthritis degradation of cartilage of knee joints causes inflammation may be due to the release of inflammatory cytokines, which are responsible proteolytic digestion of cartilage in knee joints. In our study female subjects suffering from knee OA of age group 40-60 years (Post menopausal stage) showed a decreased level of estrogen hormone (p<0.001) and TNF-α, IL-6 increased significantly (p<0.001) as compared to healthy control subjects. (Table1). This is consistent with the study of Masshiko et al [7], Jannone and Lapadula [8] and Fernands et al [9].

Increased secretion of TNF-α & IL-6 is directly related to activation of osteophytes in synovial fluid of knee osteoarthritis patients. TNF-α & IL-6 also stimulates chondrocytes, which are responsible for enhanced activity of proteolytic enzyme. i.e.- matrix mettaloprotease enzyme (MMPs). The cartilages are prime site of osteoarthritis diseases, and is very sensitive to change in sex hormones level [10, 11, 12].

The correlation study between TNF-α, IL-6 and estrogen hormone showed an inverse relationship between them (r < 0.001) (Table2). It may be due to estrogen deplation during menopause which induces TNF-α, IL-6 production from a peripheral blood monocytes and bone marrow cells. Estrogen therapy may help in improvement of MMPs level and may provide some chendorprotective effects in osteoarthritis females subjects. This is agreement with the study of Vonmuhlenel et al [2], Parazzini et al [10], Janecauley et al [11].

It is concluded from the study that in post menopausal stage (40-60 years) females the production of TNF-α, IL-6 is due to lack of estrogen deficiency. TNF-α, IL-6 may used as a suggestive marker for assessment of knee OA

References

1. Moheu E, Dreiser RL, Dewailly J. Hand osteoarthritis patients characteristics according to the existence of hormone replacement therapy. Osteoarthritis Cartilage 2000; 8(supA): 533-537.
2. Vonmuhlen D, Morten D, Vonmuhlen CA, and Barrett conmore E. Post menopausal estrogen and increased

risk of clinical osteoarthritis at the hip, hand and knee in alder women. Journal of Women health 2002; 6:511-518.
3. Sunyer Tersa, Lewis Jennifer, Collinosdoby Patricia and Osdoby Philip. Estrogen bone protective effects may involve differential IL-1 receptors regulation in human osteoclast cell 1999; 10; 1409-1420.
4. Kalle Soderstram, Emily Stein, Paula Colmenero, Ulrich Purath, Ulf Mullerlander. Natural killer cells trigger osteoclastogenesis and bone destruction in osteoarthritis. PNAS 2010; 107(29):13028-13033.
5. Rogers A, Eqstell R. Effects of estrogen therapy of postmenopausal women on cytokines measured in peripheral blood. Journal of bone mineral research 1998; 13:1577-1586.
6. Blagojevic C, Jinks A, Jeffery KP. Risk factors for onset of osteoarthritis of the knee in alder adults. Osteoarthritis and cartilage 2010; 18(1):24-35.
7. Mosslhiko, Kbayashi and Isha Moussa. Role of IL-1 and TNF- α in matrix degradation of human osteoarthritic cartilage. Arthritis Rheum 2005; 52:128-135.
8. Lamane F and Lapadula. The pathophysiology of osteoarthritis. Aging clinical exp. Research 2003; 15 (5): 346-372.
9. Ferrandas JC, Martel Pelletier JP. The role of cytokines in osteoarthritis pathophysiology. Biarcheology 2002; 39(12):237-246.
10. Parazini F. Menopausal status hormone replacement theraphy use and risk of self reported physician diagnosed osteoarthritis in women attending menopause clinics in etaly. Maturitas 2003; 46(3):207-212.
11. Janecauly A, Kentwoh C, Graceegeland, Michael Nevitic, Lawrence Cooperstein, Jiffrey Rohay, Adele Towers and Jamesgutai P. Serum sex hormone and severity of osteoarthritis of the hand. Journal of Rheumatology 1993; 20:1170-1175.
12. Sanchez C, Gabay O, Salvat C, Henrotin YE and Berenbaum F. Mechanical loading highly increase IL-6 Aproduction and decrease OPG expression by osteoblast. Osteoarthritis Cartilage 2009; 17:473-481.

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