Research Article

Osteopontine in knee osteoarthritis

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Abstract

Background: Osteoarthritis is a painful chronic joint disease characterized by structural changes to the whole joint, including loss of articular cartilage, development of osteophytes, synovial inflammation, subchondral bone changes, meniscal damage, muscle weakness, and ligamentous laxity. **Aim of the work**: To detect osteopontine (OPN) in knee osteoarthritis. **Methods**: 60 patients diagnosed as primary knee OA fulfilling Arthritis Rheum 1986 OA classification criteria, And 60 healthy control were included. All patients subjected to through history taking and full examination, body mass index, plain x ray knees PA view to assess severity according to Kellgren and Laurence grading, plasma and synovial fluid OPN levels, and plasma OPN for control. Assessment of pain for OA patients by patient pain visual analogue scale (VAS) and for functional status by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), ESR,CRP were done. **Results**: there was significant difference between both groups regarding plasma osteopontine ($p<0.0001$), OPN levels in OA patients in plasma and synovial fluid was correlated with each other ($p <0.0001$), patient pain VAS, WOMAC score, K-L grading were correlated with plasma OPN levels with p value (0.001, <0.001, <0.001), and with synovial fluid OPN levels in primary OA patients with p value (0.008, <0.001, <0.001) respectively. ESR positively correlated with plasma OPN p=0.004. **Conclusion:** OPN is higher in OA patients more than control, and it is higher in synovial fluid than plasma in knee OA patients, OPN correlated with markers of systemic inflammation and has impact on functional status so it can be used as a diagnostic and prognostic factor in knee osteoarthritis.

Keywords: Osteoarthritis – OPN.

Introduction

Osteoarthritis is a painful chronic joint disease characterised by structural changes to the whole joint including: loss of articular cartilage, development of osteo-phytes, synovial inflammation, subchondral bone changes, meniscal damage, muscle weakness, and ligamentous laxity. It results from a complex interplay of genetic, metabolic, biomechanical, and biochemical factors. At the knee, osteoarthritis most commonly affects the medial tibiofemoral and patellofemoral joint compartments. (Zhang et al., 2010).

Biochemical markers can be used to detect the disease and determine its severity. Therefore the extracellular matrix proteins were crucial to the occurrence and development of osteoar-thritis. some extracellular matrix proteins such as osteopontin (OPN) was found to play important roles in promoting the inflammatory occurrence of cartilage cells in knee osteoarthritis, As an important extracellular matrix protein, OPN can mediate cellular growth, survival, adhesion and migration in osteoarthritis (Hasegawa et al., 2011 and Qin et al., 2013).

Aim of the work

To detect osteopontine (OPN) in knee osteoarthritis.

Patients and methods

The study conducted in Minia university hospital, included 60 patients with primary knee osteoarthritis(group I) and 60

apparently healthy controls(group Π), patients in group I was complaining of knee effusion candidate for aspiration for detection of synovial fluid OPN level, both groups also were tested for plasma OPN level. All patients fulfilled criteria for diagnosis of primary knee osteoarthritis (Altman et al., 1986) were included as (group I). Sixty apparently healthy volunteers were served as a control group (group Π). Patients with other rheumato-logical diseases as rheumatoid arthritis, systemic lupus, gouty arthritis, Other forms of arthritis, cancer or other chronic inflammatory diseases, Secondary knee osteoarthritis, Diabetes mellitus were excluded from the study. The nature of the study was explained to all patients. plain x ray knees PA view to assess severity according to Kellgren and Laurence grading (Kellgren, and Lawrence, 1957), were ordered in all the patients, functional assessment of OA patients using WOMAC score (Bellamy et al, 1986) and pain assessed by patient pain VAS (Price et al., 1983)., plasma OPN level were done for all patients and control while synovial fluid done for patients with knee OA ESR and CRP also done. A consent was obtained from all patients.

Statistical analysis

Analysis of data was done by personal computer using SPSS (Statistical program for social science) version 16.The data of all software patients and controls were fed into an IBM personal computer. Data were expressed as mean ± SD for parametric variables and as number and percent for non-parametric variable. Comparison between groups for parametric data was done by independent samples t-test (unpaired t-test). The difference was considered significant if $P < 0.05$. The Bivariate Correlations procedure computes Pearson's correlation coefficient with its significance levels. Pearson's correlation coefficient is a measure of linear association for parametric variables and Sperman-rho correlation coefficient for nonparametric variables.

Results

Characters of OA patients; demographic data, laboratory investigation, functional status and radiological KL grading in table (1).

Table (1): characters of OA patients

Parameters mean±SD and/or n(%)		**OA patient n.= 60**
Age (y)		46-72(56.3±7.95)
DD (y)		2-10 (5.8 ±2.33)
BMI	**Over weight**	4 (6.7%)
	Obese I	16 (26.7%)
	Obese II	24 (40%)
	Obese III	16 (26.7%)
VAS		5-10 (7.53±1.22)
WOMAC total score		45-96 (74.26±14.07)
KL grading	**I**	5 %
	II	35 %
	III	38.33 %
	IV	21.67 %
Plasma OPN		92-222 (136.67±35.1)
Synovial fluid OPN		162-298 (218.4±37.7)
ESR mm/ 1st hour		8-36 (23.97±7.4)
CRP		53 (88.3%)

Functional status and severity in group I (OA patients): Table 2 shows that patient pain VAS, WOMAC score, K-L grading were correlated with plasma OPN levels with p value (0.001, <0.001, <0.001), and with synovial fluid OPN levels in primary OA patients with p value (0.008, <0.001, <0.001) respectively. ESR positively correlated with plasma OPN p= 0.004.

Table 2: Correlation between plasma & synovial osteopontine with demographic data, disease functional and severity indices in OA patients:

Parameters r (p)	Plasma OPN	Synovial fluid OPN
Age	0.032 (0.730)	0.800 (<0.0001)
DD	0.155 (0.236)	0.390 (0.002)
BMI	0.629 (<0.0001)	0.074 (0.574)
Patient pain VAS	0.431(0.001)	0.338 (0.008)
WOMAC totoal score	0.342 (<0.001)	0.358 (<0.001)
KL grading	0.358 (<0.001)	0.680 (<0.001)
ESR	0.362 (0.004)	0.087 (0.510)
CRP	0.017 (0.895)	0.689 (0.455)

Discussion

Osteoarthritis (OA) is a low-grade inflammatory disease of synovial joints and the most common form of arthritis (Berenbaum, 2013). It is a leading cause of chronic pain and physical disability in older individuals. OA is one of the most costly and disabling forms of joint disease, being far more common than rheumatoid arthritis (RA) and other forms of joint disease (Cross et al., 2014).

Osteopontin is a critical intrinsic regulator that plays an important role in OA progression (Gao et al., 2010). The increased expression of OPN has been observed in the joints of patients that were reported to be correlated with the severity of joint lesion and inflammatory status in the OA patients (Honsawek et al., 2009 and Matsui et al., 2009).

In our study patient pain VAS, WOMAC score, KL grading was positively correlated with plasma and synovial OPN levels.

In agreement with our study Lee et al., (2013) studied thirty four patients with knee OA included eight men and 26 women, with a mean age of 65.5 ± 7.9 years and mean disease duration of 38.2 ± 48.9 months. Also in the study of Kim et al., (2016) VAS of knee pain was 5.68 ± 0.42, Total WOMAC was 89.9 ± 7.5, WOMAC pain was 17.4±1.3, WOMAC stiffness was 7.3±0.9, and WOMAC function was 63.8±6.

Plasma osteopontine show statistically significant difference between both groups (p<0.001), and synovial fluid OPN was significantly higher than paired plasma level in primary OA patients.

In agreement with Sittisak et al., 2009 who found in a similar study on Plasma OPN (in patients and control) and in synovial fluid OPN (in patients) levels in knee OA patients, that patients had higher plasma OPN concentrations compared to healthy controls (P <0.0001). Also OPN levels in synovial fluid were significantly higher with respect to paired plasma samples (p <0.001).

In another study done by Qin et al., 2013, who examined the synovial fluid from 42 patients with knee OA and 40 cases of the normal control group had effusion due to traumatic causes as meniscus injury or lower extremity fracture surgery in the hospital at the same period for OPN level and demonstrated that the expression levels of OPN in OA group was significantly higher than those in the control (post traumatic) group, (P<0. 05)

In agreement with Haider et al., 2014 who found In their study about OPN in knee OA patients and control, that plasma OPN level significantly correlated with synovial OPN in OA patients (r =0.806, P < 0.001), a significant difference between patients and controls as regards the plasma OPN levels (t =8.534, P < 0.001), OPN in synovial fluid was higher with respect to paired plasma. Also, OPN level in both plasma and synovial fluid was significantly correlated with severity of knee pain (r =0.878, r =0.795, p <0.001).

In conclusion

This study suggests that OPN is an inflammatory marker that can be used as a diagnostic and prognostic marker in knee OA.

Acknowledgment:
Many deep thanks and gratitude go to my supervisors, my colleagues, patients and every person who had helped me by any means throughout this work.

Conflict of interest: The authors declare that there is no conflict of interest.

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