

Phospholipase A₂

Phospholipase A₂ in Herniated Lumbar Discs : Its Relevance to Pain

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– Abstract –

Study Design : A prospective study.

Objective : To determine whether phospholipase A₂(PLA₂) activity in herniated lumbar disc is correlated with clinical, radiographic and anatomic signs of the patients with herniated nucleus pulposus.

Summary of Literature Review : Several studies have suggested inflammation around nerve root as a mechanism of sciatica and PLA₂ emerges as a key enzyme of the inflammation. However, consensus about association between PLA₂ and sciatica has been lacking. In addition, there has been no report that investigated the relationship between cytosolic and membrane PLA₂ in herniated disc and patient's symptoms.

Materials and Methods : Human intervertebral disc materials were obtained from 33 patients who underwent discectomy for HNP. The information was noted about smoking history, medication of NSAID, symptom duration, pain score on a visual analog scale(VAS), positive angle of straight leg raising test (SLR), neurologic deficits, Thompson grade of herniated disc, volume of herniation shown by the MRI and type of herniation based on the operative record. These data were matched to the PLA₂ activity in herniated disc measured using Western blotting analysis. PLA₂ activity was expressed as the relative percentage compared to that of a 33-year-old female disc obtained during an operation for spinal fracture. The analysis was carried out using Mann-Whitney test, Pearson correlation analysis, simple linear regression analysis. A value of p<0.05 was considered significant.

Results : Cytosolic and membrane PLA₂ activity showed no statistical relationship to clinical, radiographic and anatomic characteristics of herniated disc. However, membrane PLA₂(active form) activity was correlated with the pain score on VAS(p=0.013, r=0.481), while cytosolic PLA₂(latent form) showed no statistically significant correlation with the pain score.

Conclusion : This study demonstrates that membrane PLA₂ activity is correlated with the pain score. It also suggests that selective PLA₂ inhibitors could be used for the alternative treatment modality of HNP.

Key Words : Herniated lumbar disc, Phospholipase A₂, Clinical relevance

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2001

7

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Interpore Cross

15,17)

-80 .

(1xPBS, 1% NP-40, 0.5% sodium deoxycholate, 0.1% SDS, 10 μ g/ml aprotinin, 1mM PMSF, 1mM sodium orthovanadate) (800g \times 10 min, 15000g \times 15 min at 4) , (50000g \times 2 hours at 4) .

(cytosolic fraction) -80

(membrane fraction) 1ml -

80 . Bradford assay

10% gel

Hybond ECL

membrane membrane 5%

1xTBS-T(blocking) blocking

, blocking 1 μ g/ml PLA₂ antibody가

1 . Horseradish peroxidase가

anti-mouse IgG blocking

1 x-film

densitometry .

33

2)

Phospholipase A₂(PLA₂) arachidonic acid
prostaglandin, leukotriene, platelet activating factor

, ,
PLA₂ 가 가
1,8,14,18)
PLA₂가 16), PLA₂
가 6,12,16)
PLA₂ cytosolic fraction
membrane fraction 2,4,10,11),
cytosolic, membrane fraction
PLA₂
가 ,
가 33
14 54
33.2 가 18 , 가 15

linear regression analysis, Mann-Whitney test, correlation analysis, Simple p value가 0.05가 .

Visual analogue scale

Thompson grade		T2		T1		Visual analogue scale	
33%	small, 33%	66%	14.0	5.5	10	8.2	15
medium, 66%	large	13)	17	44.2	70	15	15
contained type		Thompson grade II		8 , grade III		8 , grade IV	

Table 1. Relative activity of cytosolic PLA₂ in patients with different patient's history and clinical manifestation.

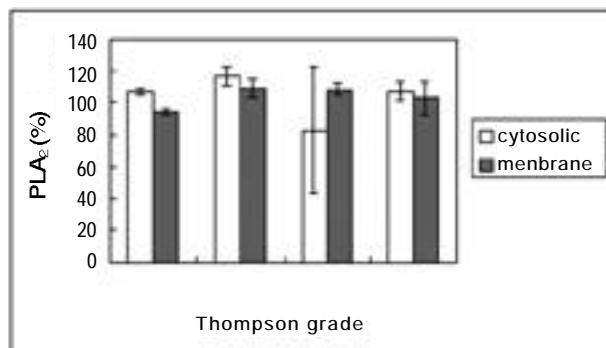
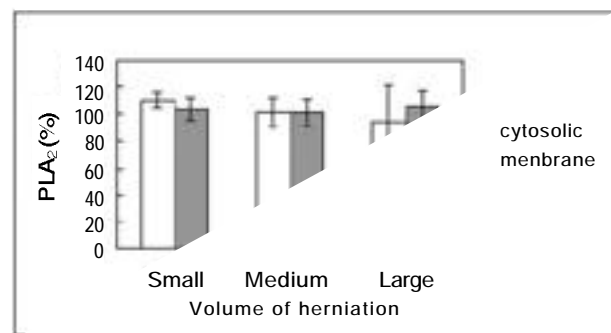
	Positive(%)	Negative(%)	p-value
Smoker	102.6 ± 12.2	88.7 ± 26.8	NS
NSAID user	90.2 ± 25.1	103.8 ± 13.9	NS
Motor dysfunction	96.2 ± 25.8	90.8 ± 21.9	NS
Sensory dysfunction	93.1 ± 24.2	93.3 ± 23.4	NS

NS : not significant

Table 2. Relative activity of membrane PLA₂ in patients with different patient's history and clinical manifestation.

	Positive(%)	Negative(%)	p-value
Smoker	104.0 ± 9.9	96.5 ± 21.3	NS
NSAID user	94.2 ± 21.4	107.4 ± 8.4	NS
Motor dysfunction	102.6 ± 13.0	97.6 ± 20.1	NS
Sensory dysfunction	99.8 ± 15.7	99.8 ± 19.3	NS

NS : not significant

**Fig. 1.** Comparison of disc PLA₂ activity as Thompson grade. p value > 0.05**Fig. 2.** Comparison of disc PLA₂ activity as volume of disc herniation. p value > 0.05

7 , grade V 10 가
small 13 , medium 10 , large 10 가
contained type 25 non-contained
type 8 .

PLA₂ 100
, cytosolic PLA₂ 93.2%, mem-
brane PLA₂ 99.8% . ,
, cytosolic
PLA₂ membrane PLA₂
(Table 1,2), ,
cytosolic PLA₂ membrane PLA₂

Thompson grade cytosolic PLA₂ membrane
PLA₂ (Figure 1),
(Figure 2).
cytosolic
PLA₂ membrane PLA₂

(Figure 3). Visual analogue scale
cytosolic PLA₂

(Figure 4), membrane PLA₂
(Figure 5, r=0.481, p=0.013).

PLA₂
가 ,
PLA₂

. Saal ¹⁶⁾ 5
PLA₂
PLA₂ 20 100,000
, Franson ⁶⁾
PLA₂ Albino mice

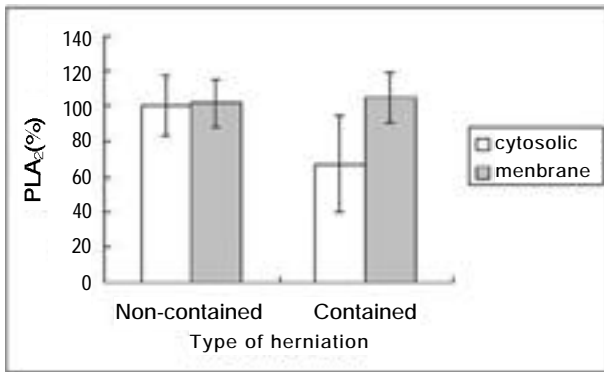


Fig. 3. Comparison of disc PLA₂ activity as type of disc herniation. p value > 0.05

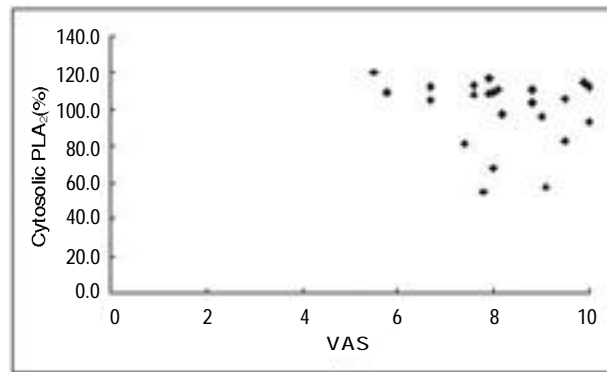


Fig. 4. Correlation between cytosolic disc PLA₂ activity and the patient's pain score on a visual analog scale. Cytosolic PLA₂ activity showed no statistical relationship to the patient's pain score. p value > 0.05

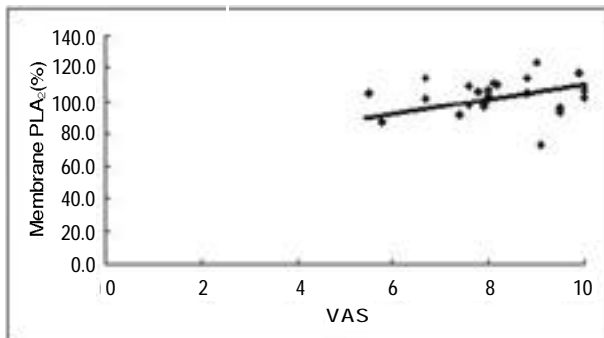


Fig. 5. Correlation between membrane disc PLA₂ activity and the patient's pain score on a visual analog scale. Membrane PLA₂ activity was correlated with the patient's pain score on a visual analog scale. $r=0.481$, $p=0.013$

mal ER)

. Yoshihara ¹⁹⁾ rat brain

cytosolic PLA₂

membrane PLA₂

translocation

PLA₂ Western blotting analysis

cytosolic membrane fraction

Muriel ¹³⁾ 31

PLA₂

PLA₂

hindlimb footpad

Mats ¹²⁾ synovial-type PLA₂

(sequestered disc) 가

(non-sequestered disc) 가

⁷⁾, Muriel

¹³⁾

PLA₂

, PLA₂ , PLA₂

, Saal ¹⁶⁾ 5

, Nygaard ¹⁵⁾ 37

cytosolic fraction membrane fraction

PLA₂

contained

type non-contained type

Kramer ¹⁰⁾ human monoblast U937 cell , Clark

⁴⁾ COS-1 cell PLA₂가 cytosolic frac-

tion membrane fraction

Burns ²⁾ PLA₂

(cytosol) 가

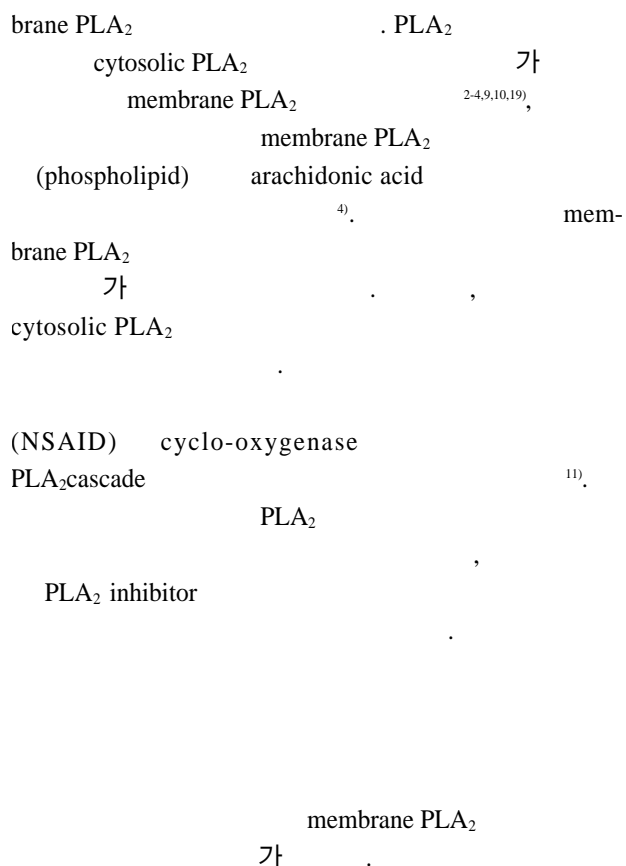
(microsomal endoplasmic reticulum, microso-

PLA₂ Visual analogue scale

Visual analogue scale

cytosolic PLA₂

, mem-



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