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ORIGINAL ARTICLE

# The Age Significance of Lumbar Disc Extrusion or Sequestration: A Systematic Review of the Literature

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## ABSTRACT

**BACKGROUND CONTEXT**: Surgery of lumbar disc extrusion or sequestration is usually reported in young adult. The significance of age has not been determined when one considers that lumbar disc herniation is the most common reason of spine surgery.

**AIM**: To review the recent evidence and document the mean age at the time of lumbar disc surgery.

**METHOD**: A search of Medline, Embase, Cochrane database and cross references from 1980 to 2014 was conducted to identify the mean age of patients who underwent lumbar disc surgery. Two reviewers independently evaluated and extracted English published articles that contained keywords of lumbar disc herniation, extrusion and sequestration. Quality of evidence was classified into 3 levels.

**RESULTS**: There were totally 134 papers, 49 were excluded. Of all the 11,803 patients, 7,021 were male (59.48%) and 4,782 were female (40.52%) respectively with mean age of 41.75 years, age ranged from 18 to 96 years. All 85 articles were classified as 19 randomized controlled none concealed trials - level I, 34 prospective comparative studies - level II and 32 retrospective – level III evidence.

**CONCLUSION**: Patients with proven damaged disc(s) are at greater risk to have lumbar discectomy at the age of 41.75 years.



**Key words:** Age; Lumbar disc; Extrusion; Sequestration

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## INTRODUCTION

The human lumbar intervertebral disc is a complex structure with three distinct components that undergoes progressive changes with age, chemical and mechanical process[1-4]. In lumbar disc literature, the advanced damage of extrusion or sequestration may inevitably result in other spinal deformities and potential serious consequences[5-7]. Tears within the disc can present itself at any age with some exceptional cases in children[8-9]. Even since the first description of the ruptured intervertebral disc in 1934[10], the presence of well established tissue damage has been widely used as an indication requiring surgical treatment. There are now an increasing number of scientific articles using modern technology such as intervertebral disc tissue engineering, advance biochemistry assay method and cell therapy[11-16]. Surprisingly, the influence of range or mean age when patients met the criteria for surgery has not been raised. For the purposes of this study, the review was conducted to document the mean age at the time of surgery as well as its significance and emphasize some interesting information in the literature.

## MATERIALS AND METHODS

Relevant randomized controlled trials (RCTs) and comparative observational studies were identified using computerized and hard

document search. Most common database of published literature included the Cochrane database, Embase and Medicine through Pub Med and cross references. Search terms or keywords were lumbar disc herniation, extrusion and sequestration. Only English language articles between 1980 and 2014 that addressed adult patients older than 18 years, range and the mean age at the time of surgery, at a single level and no other spine conditions were included. Studies not involving surgery such as non-operative treatment or laboratory, radiology, case report and duplicated reports were discarded.

Data from the included studies were extracted by 2 independent reviewers using a standard data abstraction sheet. The relevant information were (1) Country / department; (2) study design (prospective or retrospective; (3) types of surgery: a. standard with or without microscope and b. minimal invasive surgery, MIS (percutaneous or endoscopic discectomy); (4) number and gender of patients and (5) mean and range of age. Selection was based on the basis of title, abstract and sufficient detail in the materials and methods. Disagreement was resolved by discussion and clarified information.

Quality of evidence was graded into 3 levels[17]: Level I- prospective randomized controlled trial (RCT); Level II – prospective non-randomized comparative study; Level III – retrospective comparative studies or case-controlled study. Level IV – case series or reports and Level V – expert opinions were excluded. For quality of RCT, methodology should contain detail of randomization, concealment and clear description of group allocation[18].

## RESULTS

There were totally 134 papers (Table 1), 49 were excluded as they did not include relevant data. One quarter (25%) of these contained incomplete data of age and gender. Of the 85 accepted reports, there were 19 randomized controlled none concealed trials - level I[19-37], 34 prospective comparative studies - level II[38-71] and 32 retrospective – level III evidence[72-103]. Of these, 35 articles were from the United States, 23 from Europe and 23 from Asia while 4 came from other countries.

Among physicians, orthopedists (45 articles) were more frequent than neurosurgeons (33 articles). Co-ordination between orthopedist and neurosurgeon was found in 7 papers. There were totally 11,803 patients, 7,021 male (59.48%) and 4,782 female (40.52%) with mean age of 41.75 years, range 18-96 years.

Patients were operated on using standard open discectomy (56 articles) - with microscope 30 and without 40. Among those with minimal invasive surgery, there were 34 endoscopic, 12 percutaneous and 29 studies that used more than 1 technique for comparison.

## DISCUSSION

Available literature has almost dealt with patient benefit for surgery and which surgical technique that would provide the best outcomes.

**Table 1**

| Range of year | Papers |
|---|---|
| 1981-1985 | 9 |
| 1986-1990 | 13 |
| 1991-1995 | 14 |
| 1996-2000 | 13 |
| 2001-2005 | 25 |
| 2006-2010 | 38 |
| 2011-2014 | 21 |
| Total articles published at 5 years intervals. | 134 |

The review at present shows the strong increase in overall rate of lumbar disc surgery. Findings indicate high expected growing numbers of first disc surgery with greater rate found in the United States than other continents[104,105]. Findings also reviewed a large number of patients – 11,803 patients underwent a variety of surgery performed by both Orthopaedists and Neurosurgeons at a range of academic and other spinal centers. The less frequent number of operations performed by neurosurgeons is not consistent with some earlier studies[106-109].

Particularly in the last decade (twentieth century), the review clearly shows the burgeoning of new published articles as well as the emergence of less traumatic operative techniques in disc surgery[110-111]. Despite an immense scientific interest, there are small number of RCTs. As expected, these trials are more difficult to design and conduct though a reasonable level of evidence can be provided. Within all studies a number of flaws such as high cross over rates, varied statistic techniques and unreported refusal rate could be considered as threats to their validity[110,112]. The greater number of observation studies in this analysis may provide some accurate mean effects of one treatment compared with another. As has been stated, the strength of these studies from multicenters may be readily obtained when possible bias can be reduced[112].

As shown, all the surgical techniques with results were quite variable. These national and international discrepancies may be due to professional preferences in choice of procedure differences in patient selection, study protocols and the uncertainty of definition and criteria for disc surgery[106,108]. Open discectomy remains the most common approach for lumbar discectomy. A more acceptable concept of minimal invasive surgery (MIS) could be observed without providing comprehensive information regarding the potential risks. Part of recent meta-analysis also concluded that better benefit could be obtained when performed in specialized centers by experienced surgeons[113]. A consensus of opinion in the literature concerning the growing number of lumbar spine surgeries would highlight the need for further improvement that would maximize clinical outcomes.

For the significance of demographic data, the analysis found a greater frequency of lumbar disc surgery in men than in women without covering its effect on the prognosis. For the effect of age in disc literature, high frequency tears within the disc would appear to occur before the age 30 years and become more pronounced with advanced age[114-116]. With regard to the mean age as present (41.75 years), the disc extrusion or sequestration is neither age dependent nor directly correlated with degeneration grade[106-109]. At this period, some vulnerable patients may be subjected to a complex pattern of loads, causing an abrupt displacement of disc material that requires removal. Although the study could not substantiate the significance of age at the time of surgery, this mean value may be used as a considerable limit but not an objective criteria. As the displaced disc tissue can be resolved with time and certain risk factors, some patients who can tolerate their symptoms beyond this period may be treated without surgery.

To select a better option of treatment for a young patient with moderate nerve root compression is especially difficult. Surgeons should be realized firstly that despite a successful discectomy, some patients may have the probability of recurrent pain and disability. Secondly, there are countless patients who undergoing disc re-operation. Literature indicated that more than half may need re-operation within 0.5-1 year after primary surgery[106-109]. Thirdly, some may have negative long-term results irrespective of the method used to provide treatment.

On the basis of the current results, some patients may turn to in

moment of crisis at their middle age of life[117], particularly after failed surgery. Adverse event of disc lesion as well as surgical procedure would also have devastating impact on families, societies and economics.

For lumbar disc herniation, non-surgical treatment should be recommended in the first instance[118,119]. Discectomy that may give good results should mainly be restricted to clearly defined disc damage causing intractable pain and associated nerve entrapment signs[120,121]. Patients should be fully informed of the potential risks of the first disc surgery as well as possibility of a later necessity for re-operation. Surgery should be justified to those who need it.

## CONCLUSION

A large number of patients (11,803) with a male predominance of 59.44%, underwent a variety of surgeries, at the mean age of 41.75 years. There is a strong increase in overall rate of lumbar disc surgery performed by both Orthopaedists and Neurosurgeons. Open discectomy was the most common approach for lumbar discectomy.

## CONFLICT OF INTERESTS

There are no conflicts of interest with regard to the present study.

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