Lumbar Spine Surgery in Israeli Arabs and Jews: A Comparative Study with Emphasis on Pain Perception

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Abstract

Background: Surgery for spinal stenosis is a frequent procedure in elderly patients. Presentation, hospital course, and outcome of disease including pain perception may vary among patients of different ethnic origin.

Objectives: To evaluate whether differences in various medical indicators can explain differences in pain perception between two ethnic groups

Methods: We conducted a case-control study on the experience of two spinal units treating a mixed Arab and Jewish population, and compared the data on 85 Arab and 189 Jewish patients undergoing spinal lumbar surgery.

Results: Arab patients were younger ($P = 0.027$), less educated ($P < 0.001$), had a higher body mass index ($P = 0.004$) and included a higher proportion of diabetics ($P = 0.013$). Preoperative pain intensity ($P = 0.023$) and functional disability ($P = 0.005$) were more prominent, and factors associated with pre- or postoperative pain perception differed between the two ethnic groups. Despite these differences, results on follow-up were similar with respect to pain perception and level of disability.

Conclusions: A better understanding of ethnic differences is crucial for predicting surgery outcomes.

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Israeli society is typically heterogeneous, consisting mostly of Jews and Arabs (Muslims, Christians and Druze). The Jewish population predominates, with Arabs representing about 20% of the total Israeli population [1]. Arab society in Israel is undergoing a gradual transition – from rural and agricultural towards one that is more urban, modernized and westernized. This affects the whole spectrum of daily life, and involves various cultural, social, economic and educational aspects. The Arab Israeli population is relatively young due to high fertility rates and shorter life expectancy. Only 3.1% of Israeli Arabs are over the age of 65, compared with about 11% of Israeli Jews [2]. However, a significant increase is expected both in absolute numbers and percentage of elderly Arabs in the coming years, together with a rise in those affected by chronic diseases and related disabilities.

Due to improved surgical techniques, the rate of spinal surgery in elderly patients has increased. Surgery is usually associated with improved functional activities of daily living and with pain, yet results frequently depend upon baseline parameters such as gender [3], the co-existence of diabetes [4], etc.

It is recognized that levels of discomfort differ between people of different cultures, and that pain expression and words describing pain demonstrate cultural differences [5]. A classic study by Zola [6] demonstrated cultural differences in pain perception and expression of illness across Caucasian racial groups. It verified stereotypes of English stoicism, Italian expressiveness and Irish fatalism, but a stereotype cannot be used for everyone in a racial or ethnic group. Yosipovitch et al. [7] reported similar observations. The purpose of the present study was to evaluate possible differences between two ethnic groups undergoing spinal surgery, and to identify factors potentially affecting both pre- and postoperative pain perception in these two groups.

Patients and Methods

The study was performed in a spinal surgery unit of a university-affiliated hospital serving the population of the Sharon district. The catchment area of the hospital encompasses about 870,000 inhabitants, 20% of whom are Arabs.

We included patients aged 65 years and older who had undergone surgery for lumber spinal stenosis during a 10 year period starting on 1991. The diagnosis of lumbar spinal stenosis was made on the basis of clinical and radiographic evidence. Indications for surgery were disabling back and/or leg pain, and a progressive decline in their walking ability in the presence of spinal lumbar diskopathy. Decompressive laminectomies were performed at stenotic levels. Whenever a disk protrusion represented a significant element in the stenosis, a diskectomy was performed. Postoperative complications were defined as adverse events occurring following hospitalization and within 90 days thereafter. A database was compiled using inpatient medical records, and patients were interviewed by one of the authors (Z.A.) using a structured questionnaire.

Data included: demographic details (age, marital status, years of education); body mass index calculated as weight divided by height squared (kg/m^2); co-morbidity status (based upon ICD-9 codes [8] and including arterial hypertension, ischemic heart disease, congestive heart disease, dysrrhythmias, peripheral vascular

disease, diabetes mellitus, pulmonary disease, hypothyroidism, peptic disease, chronic renal failure, depression, Parkinson's disease, osteoarthritis, previous history of myocardial infarction, cerebrovascular accident, and total knee or hip replacement). Other data included clinical presentation (low back pain, lower extremity pain, night-time pain, neurourogenic claudication, muscular weakness, and numbness); walking ability (distance); and rates of repeated surgery.

The preoperative risk was assessed by the American Society of Anesthesiology scale. Functional assessment was assessed using the Barthel index of activities of daily living. Assessment of pain intensity was determined by a Visual Analog Scale (0 = pain, 10 = maximal pain). Recording of pain perception was performed before operation and on follow-up. Patients' satisfaction rate was graded as "very and/or somewhat satisfied," and "somewhat and/or very dissatisfied." The reliability and validity of this single-question questionnaire of health care behavior and satisfaction has already been established [9].

Statistical analysis

Descriptive statistics were performed by SPSS 12.0. Analysis of results was performed within (preoperative to postoperative) and between the groups. Univariate associations between independent variables and preoperative pain perception/delta pain on follow-up were calculated with the Wilcoxon rank sum test for categorical variables and the Spearman's rank correlation test for continuous variables. Non-parametric data were analyzed by the chi-square test.

Multivariate analyses of the correlates of the preoperative pain perception/delta pain on follow-up were performed with multiple linear regression using the preoperative pain perception and pain on follow-up variable as the dependent variable. The independent variables included age, gender, education level, BMI, co-morbidity status, co-morbid diseases, number of decompressed levels, duration of disease, low back pain, lower extremity pain, neurourogenic claudication, and combination of them, muscular weakness, numbness, functional status (preoperative and at follow-up), walking distance (preoperative and at follow-up), rate of complications, and patient satisfaction.

Results

During the study period, 367 patients underwent surgery for lumbar spinal stenosis. Based on ethnic identity, 85 of the patients were Arabs and 189 were Jewish. The response rate at follow-up was 80% (220/274): 81% (69/85) in the Arab group and 80% (151/189) in the Jewish group. More than half the patients were males: 53% (36/69) in the Arab group and 52% (78/151) in the Jewish group.

Arab patients presented with higher BMI than Jewish patients (28.46 and 26.19 kg/m^2, respectively; P = 0.004), and a lower mean educational level (8.06 and 9.73 years, respectively; P < 0.001). The mean number of co-morbidities showed a non-significant trend of being higher in Jews compared with Arabs (2.73 and 2.67 per patient, respectively). Cardiovascular disease was predominant in both groups (90% in Jews and 80% in Arabs, P = 0.049, chi-square = 3.86); diabetes mellitus was more prevalent in Arabs than in Jews (30% and 16%, respectively; P = 0.013, chi-square = 6.15). The mean duration of disease was 58.03 and 42.61 months (P > 0.05) in Arabs and Jews, respectively. The profile of clinical presentation and preoperative risk is presented in Table 1.

Table 1. Clinical presentation of study sample

Clinical presentation	Arab patients N (%)	Jewish patients N (%)
Low back pain	58 (84)	119 (79)
Low extremity pain	61 (88)	122 (81)
Neurogenic claudication	40 (58)	110 (73)*
All three	39 (57)	74 (49)
No pain	6 (9)	8 (5)
Night-time pain	4 (6)	6 (4)
Muscular weakness	39 (57)	79 (52)
Sensory deficits	41 (59)	92 (61)

* P = 0.028, chi-square = 4.83.

Both groups presented with similar distribution of the different ASA classes. Fifty-eight percent of patients underwent decompressive laminectomy, 22% had diskectomy; the remainder underwent combinations of both procedures. The distribution of surgical procedures was similar in both groups, but mean decompressed levels were higher in Arab than in Jewish patients (1.83 and 1.61, respectively; P = 0.027).

Arab patients were younger (70.64 and 71.83 years, respectively; P = 0.027), more suffered from pain preoperatively (VAS 8.48 ± 2.27) than Jewish patients (8.07 ± 2.05, P = 0.022), and they were more functionally limited (72.75 ± 10.59 and 76.97 ± 8.58, respectively; P = 0.006). During a mean follow-up period of 45.6 months, 11% of the patients were re-operated: 12% in the Arab group and 11% in the Jewish group. A postoperative decrease in pain was observed in both groups: VAS score (Δ_{VAS}=4.91 ± 0.41 and 4.85 ± 2.7 in Arab and Jewish patients, respectively; P > 0.05. Δ indicates the difference in score on follow-up and preoperatively), while improvement was observed in mean Barthel index ($\Delta_{Barthel\ index}$ = -9.86 ± 11.01 and -9.20 ± 8.49, respectively; P > 0.05). Seventy-two percent of Arab patients and 63% of Jewish patients (P = 0.041, chi-square = 4.15) reported being satisfied (very and somewhat) with overall surgical results. Table 2 presents the correlates of patients' pain levels and dependent variables preoperatively and delta changes on follow-up.

The results of multivariable analysis of factors affecting patients' preoperative pain levels and delta changes on follow-up are shown in Table 3. The variables found to be independently and significantly associated with patients' pain perception included lower extremity pain, BMI and diabetes mellitus among Arab patients; whereas among Jewish patients they were presen-

BMI = body mass index

ASA = American Society of Anesthesiologists
VAS = Visual Analogue Scale

Table 2. Correlations (*r values*) of pre-operative pain severity and Δ (Delta) change on follow-up and variables

	Arab patients	Jewish patients
Preoperative		
Pain		
Low extremity	0.321‡	0.082
Low back	-0.007	0.415§
Night-time	0.263†	-0.024
Diabetes	-0.308†	0.065
Depression	0.140	0.170
Co-morbidities	0.304†	0.077
ASA class	0.247†	-0.166†
Age	-0.232	-0.210‡
BMI	0.318‡	0.009
Delta change		
Pain		
Low extremity	-0.262†	-0.053
Night-time	-0.429§	-0.379§
Peripheral arterial disease	-0.408§	-0.351§
Diabetes	-0.400§	-0.489§
Osteoarthritis	-0.268†	-0.554§
Total joint replacement	0.062	-0.510§
Depression	-0.302†	-0.319§
Co-morbidities	-0.239†	-0.251‡
ASA class	-0.028	-0.292§
Female gender	0.266†	0.191†
Age	-0.408§	-0.203†
BMI	-0.248†	-0.299§
Education level	0.170	0.270§

† $P < 0.05$, ‡ $P < 0.01$, § $P < 0.001$.

tation of back pain, age, osteoarthritis, depression, duration of disease, and years of education. The R^2 value for the final model comprising the significant correlates was 0.367 in Arab patients and 0.329 in Jewish patients.

Patients' pain severity on follow-up was evaluated after a mean time of 43.83 and 45.07 months for the Arab and Jewish patients, respectively (not significant). The changes (delta) in pain severity (VAS) and functional status (Barthel index) were somewhat greater in Arab compared to Jewish patients, but these differences were not statistically significant. The correlation analysis between delta pain on follow-up and potential variables is presented in Table 2, and those of the multivariate analysis of factors affecting delta pain in Table 4. The variables found as independently and significantly associated with delta pain in Arab and Jewish patients were somewhat different. The R^2 values in the final model were 0.27 and 0.44 in Arab and Jewish patients, respectively.

Discussion

The present study explores the different characteristics and factors associated with pain severity in two ethnic Israeli groups undergoing surgery for spinal stenosis. Our findings are important with regard to the following points:

Table 3. Predictors of preoperative patients' pain severity

	Regression coefficient				
	Unstandardized		Standardized		
Predictors	β^1	SE	β^2	*t*	*P*
Arab patients					
Extremity pain	-2.158	0.454	-0.436	-4.757	< 0.001
BMI	-4.599	1.058	-0.371	-4.347	< 0.00
Diabetes	-0.228	0.068	-0.305	-3.338	0.001
Jewish patients					
Back pain	1.987	0.345	0.399	5.756	< 0.001
Age	-0.085	0.025	-0.237	-3.362	0.001
Osteoarthritis	1.308	0.431	0.243	3.037	0.003
Depression	2.020	0.676	0.235	2.986	0.003
Disease duration	0.005	0.002	0.165	2.324	0.022
Education level	-0.094	0.044	-0.151	-2.147	0.033

Table 4. Predictors of change of pain severity in study groups

	Regression coefficient				
	Unstandardized		Standardized		
Predictors	β^1	SE	β^2	*t*	*P*
Arab patients					
Diabetes	-2.072	0.459	-0.418	-4.514	< 0.001
Age	-0.265	0.078	-0.309	-3.424	0.001
Osteoarthritis	-1.343	0.542	-0.228	-2.475	0.016
Peripheral arterial disease	-1.259	0.553	-0.203	-2.278	0.026
Jewish patients					
Diabetes	-2.114	0.538	-0.314	-3.927	< 0.001
Osteoarthritis	-2.291	0.610	-0.322	-3.754	< 0.001
Total joint replacement	-2.462	0.852	-0.228	-2.890	0.004
Education level	0.133	0.052	0.162	2.530	0.012
Co-morbidities	-0.312	0.127	-0.193	-2.461	0.015

- Compared with Jewish patients, Arab patients were younger, more disabled and experienced more pain, had a higher mean BMI, a higher prevalence of diabetes, and suffered from neurogenic claudication more often. These baseline differences are not surprising. The rate of disability among elderly Arabs is more than twice that among the Jewish elderly, with 44% of elderly Arabs in need of assistance in at least one basic activity of daily living [10]. The prevalence of overweight and obesity is also higher in Arabs [11] throughout all age and gender groups. In addition, the prevalence of diabetes is 1.6 times higher in the Arab population, in particular among Arab women, who have a 2.8 higher rates of diabetes compared with Jewish women [11]. These differences may account partially for the combination of lower extremity pain, diabetes and high BMI as the main predictors of preoperative pain in Arab patients. These results are in accordance with data from the inChianti study [12], which showed that about 20% of patients with intermittent claudication are diabetics compared with only 6% in those without claudication. Clearly, diabetic neuropathy and spinal stenosis may

produce similar symptoms in lower limbs, affecting both proximal and distal sensory and motor nerves. However, the higher BMI in Arab patients may result from diabetes, which could explain the higher rate of functional limitations.

- Variables associated with preoperative pain in Jewish patients differed somewhat as compared to Arab patients, and included presentation of back pain, low educational level, short duration of disease, young age, presence of osteoarthritis, and depression. Some of these correlates are well known: the association of low back pain and osteoarthritis was previously reported [13] and is attributed to axial osteoarthritis, as well as to its impact on the lower extremity weight-bearing joints by the biomechanics of axial movement. The association between pain and depressive symptoms is also well established and is probably bi-directional: chronic pain may increase the risk for depressive symptoms [14], while the presence of depressive symptoms in patients free of back pain at baseline predicted the onset of back pain over time [15]. In addition, the association between educational level and back pain has been reported previously [16].
- An interesting point is the possible association of age and pain severity. Some studies reported no difference in pain severity as a function of age [17,18], while others showed reduced pain with advanced age [19,20]. Campbell [21] suggested that various age-associated physiological changes may affect age-related differences of pain perception. In our study Arab patients were younger, yet in both groups age was inversely correlated with pain level. This is in accordance with the study by Hall and collaborators [22] who reported on lower pain levels with advancing age.
- Ethnic differences in pain perception, assessment and treatment have been identified for various types of pain [23,24]. Our data strongly support the assumption that differences in pain severity between groups relates to ethnic origin rather than to other parameters. Mechanisms underlying this phenomenon are unknown, yet sources of the differences in the pain experienced among different ethnic groups seem to be complex, involving factors related to patients, health care providers and the health care system.

Limitations

The present study has several important limitations: it was a relatively small study that covered a single district, thereby limiting the generalizability of our findings and the extent to which our results may be applied to other populations. This study was not homogenous; it included patients with spinal stenosis, disk hernia, and back pain. It was also observational in design, limited to actual patients in a single spinal surgery unit, and does not account for possible differences in quality of care in similar units. In addition, the analyses were limited to assessment of associations between variables and pain perception, ignoring other potentially important measures of well-being or quality of life.

Conclusions

There are numerous differences in baseline characteristics between Arab and Jewish Israeli elderly patients undergoing surgery for lumbar spinal stenosis. Arab patients are younger, have a higher BMI, lower education, and higher rates of diabetes. Duration of disease until surgery is shorter, the level of the operated disk is higher, pain intensity and functional disability are higher, and factors associated with pre- or postoperative pain severity differ from those observed in Jewish patients. We believe that this study contributes to a better understanding of the ethnic role for predicting the course and outcome in community-dwelling elderly undergoing spinal surgery, suggesting that a better understanding of ethnic factors is necessary to improve prediction of surgical intervention.

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