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Research Article

Assessment of spinopelvic relationship among Turkish orthopedic surgeons in total joint replacement: a survey

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ABSTRACT

Objective: This study aims to investigate the preferences of orthopedics and traumatology specialists in evaluating the spinopelvic relationship in primary total hip arthroplasty (THA) in Türkiye.

Methods: Members of the Turkish Orthopedics and Traumatology Association (n=2485) were invited to fill out the questionnaire. The survey was created using Google Forms and distributed to participants via WhatsApp and Gmail by sharing the link. A total of 205 orthopedic surgeons responded and completed the questionnaire. The survey included 13 questions about the duration of their experience, the number of THA and spinal instrumentation procedures they performed, the dislocation rates they encountered after surgery, and the radiological assessments they performed for the spinopelvic relationship.

Results: Sixty-three percent of the participants evaluated spinopelvic parameters in patients undergoing THA. Forty-seven percent of surgeons state that in their daily practice, they determine the angle of the acetabular component according to whether the spinal deformity is rigid, flexible, balanced, or unstable. While 88% of the participants stated the rate of encountering dislocation after primary THA as less than 2%, 12% of the participants stated it as more than 2%. It was observed that 40% of the surgeons with a prosthetic dislocation rate of more than 2% evaluated the spinopelvic relationship, while 67% of the surgeons with a dislocation rate of less than 2% evaluated the spinopelvic relationship.

Conclusion: Approximately half of the orthopedic surgeons in Türkiye plan component placement in primary THA cases by considering the spinopelvic relationship. In order to increase awareness about the spinopelvic relationship, it would be beneficial to give more space to this subject in training programs and conferences.

Level of Evidence: N/A.

Introduction

Total hip arthroplasty (THA) is a successful option for end-stage hip osteoarthritis.[1] Prosthesis dislocation is one of the most common complications after THA, and the rate of dislocation within the first year is between 1% and 3%.[2-4] To date, many surgical or non-surgical risk factors that cause prosthesis dislocation have been described. Acetabular component malposition is also one of the leading causes of dislocation.[5]

The safe zone for acetabular component placement, defined by Lewinnek et al,[6] has helped to reduce the rate of prosthesis dislocation encountered after THA. However, it was shown that the acetabular component was placed within the safe zone in 58% of cases with dislocations after primary THA.[7,8] Parallel to the studies reporting that the spine–pelvis relationship affects hip dislocation, the issue has gained popularity among orthopedic surgeons.[9] Standing and sitting lateral pelvis and lumbar radiographs are used for measurement and classification of spine–pelvis relationship.[10] Based on classifications, adjustment of acetabular anteversion and inclination, dual mobility, or constrained acetabular components are recommended to reduce dislocation risk.[9,11]

Although numerous studies show that component placement and appropriate implant selection, considering the spinopelvic relationship, may reduce the rate of dislocation, it is not well known whether this subject has been sufficiently noticed among orthopedic specialists and has become a part of their daily routine. Therefore, this study aimed to investigate the preferences and daily practices of orthopedics and traumatology specialists in Türkiye regarding spinopelvic relationship parameters in primary THA.

Material and methods

The study was carried out between September 2021 and December 2021. A total of 2485 orthopedic specialists who are members of the Turkish Orthopedics and Traumatology Association participated in the study. A survey was prepared containing questions about the spinopelvic relationship and was evaluated by 5 experienced surgeons who had performed more than 50 arthroplasties or spinal surgeries per year. The survey was then finalized based on their suggestions. The survey was created using Google Forms (Google LLC, Mountain View, California, USA) and distributed to participants via WhatsApp (Meta Platforms, Inc., Menlo Park, California, USA)

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and Gmail (Google LLC, Mountain View, California, USA) by sharing the link. A total of 205 orthopedic specialists responded to the online questionnaire, and their data were included in the study. The final survey consisted of 13 questions investigating the demographics of surgeons, their work experiences, the monthly number of THA or spinal surgeries they performed, complications, and radiological examinations they used for pre- and postoperative spinopelvic evaluation. Of the 13 questions in the survey, 8 were designed as single-choice questions. Questions 8 and 12 were structured as 2-option questions. Participants who answered "yes" to Question 8 were prompted to answer Question 9. Questions 9, 10, and 11 were designed to allow multiple-choice responses (Table 1). This study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the ethical committee of the Istanbul Medipol University with approval number 147 and reference number E-10840098-604.01.01-1303, date: Date: 16-02-2023. All participants signed a written informed consent form.

Statistical analysis: All data were entered into the IBM SPSS version 25.0 software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. (IBM SPSS Corp.; Armonk, NY, USA) and analyzed. The Kolmogorov-Smirnov test and skewness were used to evaluate the normal distribution. Frequency and percentage were used in descriptive statistics. Pearson chi-square and linear-by-linear analysis were used for comparative analyses. Values of $P < .05$ were considered significant. A post hoc power analysis was conducted using the G-Power software 3.1.9.6 (Erdfelder, Faul, & Buchner, 2020). The analysis employed the chi-square test in a post hoc context and revealed that, with an α level of 0.05 and a total sample size of 205, the power (1-β error probability) was determined to be 0.82. This indicates that the questionnaire included a sufficient number of participants to detect a true difference in the examined group, should one have actually existed. This finding lends support to the statistical accuracy of the analysis and effectively eliminates the possibility of a type 1 error.

Results

A total of 135 participants (66%) had been working as specialists for more than 5 years, and 77 surgeons (38%) worked in training and research hospitals. Of the participants, 53 (75%) performed less than 5 primary THAs in a month, and 179 (87%) did not perform spinal surgery. Of the participants, 180 surgeons (88%) reported a dislocation rate of less than 2%, while 25 surgeons (12%) reported a rate of more than 2%. Additionally, 188 surgeons (92%) considered malposition of the acetabular component to be effective in dislocation (Table 2).

When asked about their habit of evaluating spinopelvic parameters, it was found that 63% of the surgeons evaluated the spinopelvic parameters in cases where they performed THA. Seventy-five percent of the participants use anterior–posterior pelvis radiographs and hip lateral radiographs, 47% use standing and sitting lumbar radiographs, and 39% use lower extremity length radiographs for evaluating the spinopelvic relationship (Table 3).

HIGHLIGHTS

- In recent years, many studies have started to be published showing that the spine–pelvis relationship is effective in prosthetic dislocation.
- Approximately, half of the orthopedic surgeons in Türkiye plan component placement in primary THA cases by considering the spinopelvic relationship.
- In order to increase awareness about the spine–pelvis relationship, this issue should be addressed more in training programs and conferences.

Table 1. Survey questions

1. Specify your specialization duration. (single-choice question)
2. Please indicate the institution where you work. (single-choice question)
3. Please indicate your academic position. (single-choice question)
4. How many primary THA cases do you perform per month? (single-choice question)
5. How many spinal instrumentation and fusion surgeries do you perform per month? (single-choice question)
6. What is the rate of prosthesis dislocation after your primary hip arthroplasty cases? (single-choice question)
7. What do you think about the role of acetabular component malposition in the development of this complication in your cases of prosthesis dislocation? (single-choice question)
8. How often do you evaluate the spinopelvic parameters in patients who have had hip arthroplasty? (2-option questions)
9. What radiological measurements do you apply to evaluate the spinopelvic relationship? (multiple-choice responses, conditional follow-up question)
10. What radiological examinations do you use to evaluate spinal deformities in patients who are planning to have a hip replacement? (multiple-choice responses)
11. What radiological examinations do you use in planning hip arthroplasty for a patient with a history of spinal instrumentation and fusion surgery? (multiple-choice responses)
12. Which surgery would you recommend for a patient who has no neurological deficits but has indications for surgery for both spondyloarthrosis and coxarthrosis? (2-option questions)
13. In your daily practice, how does the degree and type of spinal deformity play a role in determining the anteversion angle of the acetabular component when performing primary arthroplasty? (single-choice question)

Regarding patients without neurological deficits but with both spondyloarthrosis and coxarthrosis, 53% of surgeons recommended spinal arthrodesis surgery as the first intervention. Furthermore, 96 surgeons (47%) determined acetabular component placement according to spinal deformity, whether it was rigid, flexible, balanced, or unstable (Table 3).

According to work experience, 51% of surgeons with less than 5 years of experience and 74% of surgeons with 20 or more years of experience evaluated the spinopelvic relationship ($P < .05$). Regarding academic position, 85% of professors and 58% of surgeons evaluated the spinopelvic relationship ($P < .05$).

A statistically significant difference was found between surgeons who performed more than 5 primary THAs (86%) and those who performed fewer than 5 (54%) in terms of evaluating spinopelvic

Table 2. Demographic data of the participants

		n	%
Duration of expertise	Less than 5 years	70	34.1
	5-10 years	50	24.4
	11-20 years	54	26.3
	Over 20 years	31	15.1
Workplace	Private hospital	41	20.0
	University hospital	58	28.3
	Training and research hospital	77	37.6
	Public hospital	29	14.1
Academic position	Operator	132	64.4
	Assistant Professor	25	12.2
	Associate Professor	28	13.7
	Professor	20	9.8
Number of THA per month	Less than 5	153	74.6
	5 or more	52	25.4
Spinal instrumentation and fusion surgery	Not performing	179	87.3
	Performing	26	12.7
Rate of prosthesis dislocation	Less than 2%	180	87.8
	2% or more	25	12.2
The effect of acetabular component malposition in cases with prosthesis dislocation?	Don't think it is effective	17	8.3
	Effective in some cases	83	40.5
	Usually effective	72	35.1
	Always effective	33	16.1

Table 3. The preferences of orthopedic surgeons regarding the spinopelvic relationship in patient undergoing total hip arthroplasty

		n	%
Do you evaluate spinopelvic relationship?	Yes	130	63.4
	No	75	36.6
How do you evaluate the spinopelvic relationship?	Pelvic tilt	117	57.1
	Sacral slope	67	32.7
	Pelvic incidence	59	28.8
What methods do you use to evaluate spinal deformities in patients who are planning to have hip arthroplasty?	Pelvis AP and hip lateral X-ray	154	75,.1
	Standing and sitting lumbar lateral X-ray	97	47,.3
	Lumbar bending X-ray	29	14.1
	Scoliosis X-ray	64	31.2
	Lower extremity lateral X-ray	79	38.5
Which radiographs do you want in THA planning in a patient with a history of spinal instrumentation and fusion surgery?	Pelvis AP and hip lateral X-ray	155	75.6
	Standing and sitting lumbar lateral X-ray	94	45.9
	Lumbar bending X-ray	40	19.5
	Scoliosis X-ray	76	37.1
	Lower extremity length X-ray	77	37.6
Which surgery would you recommend for a patient who does not have neurological deficits but who has surgery indications for both spondyloarthrosis and coxarthrosis?	Hip arthroplasty	96	46.8
	Spinal arthrodesis	109	53,.2
How does the degree and type of spinal deformity play a role in determining the anteversion angle of the acetabular component when performing THA in your daily practice?	I do not consider this situation. I insert the acetabular component with standard anteversion.	65	31.7
	I determine the angle of the acetabular component based on the rigidity and type of spinal deformity	96	46.8
	I use a larger head size to reduce the risk of dislocation in patients with spinal deformities.	60	29.3
	I use dual mobility to reduce the risk of dislocation in patients with spinal deformities.	20	9.8

parameters ($P < .05$). Surgeons who performed spinal instrumentation and fusion surgery were significantly more likely to evaluate the spinopelvic relationship (81%) than those who did not (61%) (n=21 and n=109; $P < .05$). Additionally, a significant difference was observed between the rate of prosthetic dislocation and the preference for evaluating the spinopelvic relationship, with 67% of surgeons with a dislocation rate of less than 2% evaluating the spinopelvic relationship compared to 40% of those with a rate of more than 2% (n=10 and n=120; $P < .05$) (Table 4).

Table 4. Comparison of spinopelvic relationship evaluation among participants based on their expertise, academic position, monthly case load, performance of spinal fusion surgery, and dislocation rate (n=205)

		Evaluation status of spinopelvic relationship		
		Evaluate	Does not Evaluate	*P*
Duration of expertise	Less than 5 years	36 (51%)	34 (49%)	.017*
	5-10 years	34 (68%)	16 (32%)	
	11-20 years	37 (69%)	17 (31%)	
	Over 20 years	23 (74%)	8 (26%)	
Academic position	Operator	77 (58%)	55 (42%)	.014*
	Assistant Professor	16 (64%)	9 (36%)	
	Associate Professor	20 (71%)	8 (29%)	
	Professor	17 (85%)	3 (15%)	
Number of THA per month	Less than 5	84 (55%)	69 (45%)	.001**
	5 or more	46 (89%)	6 (11%)	
Spinal instrumentation and fusion surgery	Not performing	109 (61%)	70 (39%)	.049**
	Performing	21 (81%)	5 (19%)	
Rate of prosthesis dislocation	Less than <2%	120 (67%)	60 (33%)	.009**
	2% or more	10 (40%)	15 (60%)	

***Total number of participants.*Linear-by-linear analysis was used.**Pearson chi-square analysis was used.

Experience level of surgeons was significantly associated with the prioritization of hip arthroplasty in patients without neurological deficits but with both spondyloarthrosis and coxarthrosis, with 43% of those with less than 5 years of experience prioritizing hip arthroplasty compared to 71% of those with 20 or more years of experience (n=30 and n=71; $P < .05$) (Table 5).

There were no significant differences between the experience of surgeons and the rate of prosthetic dislocation encountered or between academic title and prioritization of hip arthroplasty in patients without neurological deficits but with both spondyloarthrosis and coxarthrosis ($P > .05$).

Table 5. Comparison of prosthesis dislocation and preferred surgical priorities according to the demographic data of the participants

		Prosthesis dislocation rate			Priority		
		Less than 2%	2% or more	*P**	Hip arthroplasty	Spinal arthrodesis	*P**
Duration of expertise	Less than 5 years	58 (82.9)	12 (17.1)	.277	30 (42.9)	40 (57.1)	.026
	5-10 years	43 (86.0)	7 (14.0)		19 (38.0)	31 (62.0)	
	11-20 years	50 (92.6)	4 (7.4)		25 (46.3)	29 (53.7)	
	Over 20 years	29 (93.5)	2 (6.5)		22 (71.0)	9 (29.0)	
Academic position	Operator	108 (81.8)	24 (18.2)	.005	57 (43.2)	75 (56.8)	.267
	Assistant Professor	25 (100.0)	0 (0.0)		11 (44.0)	14 (56.0)	
	Associate Professor	28 (100.0)	0 (0.0)		15 (53.6)	13 (46.4)	
	Professor	19 (95.0)	1 (5.0)		13 (65.0)	7 (35.0)	
Workplace	Private Hospital	38 (92.7)	3 (7.3)	.276	20 (48.8)	21 (51.2)	.001
	University Hospital	53 (91.4)	5 (8.6)		39 (67.2)	19 (32.8)	
	Training and Research Hospital	66 (85.7)	11 (14.3)		25 (32.5)	52 (67.5)	
	Public Hospital	23 (79.3)	6 (20.7)		12 (41.4)	17 (58.6)	
Number of THA per month	Less than 5	128 (83.7)	25 (16.3)	.002	68 (44.4)	85 (55.6)	.240
	5 or more	52(100,0)	0 (0.0)		28 (53.8)	24 (46.2)	
Spinal instrumentation and fusion surgery	Not performing	156 (87.2)	23 (12.8)	.453	85 (47.5)	94 (52.5)	.621
	Performing	24 (92.3)	2 (7.7)		11 (42.3)	15 (57.7)	

*Pearson chi-square analysis was used.

Discussion

In this survey study, we demonstrated that 63% of orthopedic surgeons in Türkiye consider the spine–pelvis relationship when determining the acetabular component position during THA. Hip dislocation is one of the serious complications after THA.[12] Many risk factors have been identified as the cause of these complications. Recent studies have shown that the spine–pelvis relationship is a significant factor in dislocation after THA. Convincing evidence is available in the literature showing a strong relationship between the hip–spine relationship and dislocation; therefore, patients who are candidates for THA should be evaluated for lumbar spine mobility preoperatively.[13] A recent study reported that the rate of dislocation after THA in patients who had undergone lumbar spinal fusion surgery was higher than in patients without a history of fusion surgery.[9]

The study by Luthringer et al[10] classified patients undergoing primary THA according to the angles of sacral slope, pelvic incidence, and lumbar lordosis, and recommendations were made to surgeons for the position of the acetabular component to be placed. Providing group-specific recommendations for acetabular cup position can help reduce the burden of instability and related revisions in this challenging population. It has been suggested that the functional safe zone is more successful in predicting the stability of the THA than the safe zone defined by Lewinnek in determining the component position in THA.[14] Spinopelvic alignment and mobility concepts were developed, and classification systems were introduced based on these new concepts of optimal acetabular component positioning, and considering these systems has gained popularity in many arthroplasty centers. In our study, surgeons with a hip dislocation rate of less than 2% were more likely to evaluate the spinopelvic parameters than surgeons with a rate higher than 2%. This finding also confirms the importance of the spinopelvic relationship mentioned in the literature.

Many studies emphasize that the dynamic relationship between the hip, spine, and pelvis and postural changes should be taken into consideration when evaluating acetabular component position.[10] In our study, while 188 (92%) participants considered that malposition of the acetabular component was effective in the development of this complication, 17 (8%) did not consider that it was effective (Table 2).

Surgeons' evaluation of acetabular component position is often made using only anteroposterior pelvis radiographs, which do not take into account the dynamic relationship between these structures.[10,11] In evaluating spinal deformity, 154 (75%) of the participants in our study preferred pelvic anterior–posterior and hip lateral radiographs, 97 (47%) preferred standing and sitting lumbar radiographs, and 79 (39%) preferred long lower extremity radiographs (Table 3). Ninety-six of the surgeons (47%) determined acetabular component placement according to spinal deformity, whether it is rigid, flexible, balanced, or unstable (Table 3). According to our study, almost half of the surgeons use sitting or standing lateral lumbar X-rays to evaluate the spinopelvic relationship or considering spinal deformity when placing the acetabular cup in patients with spinal deformity. This indicates that more awareness is required in terms of assessing the spinopelvic relationship.

There was a significant difference between the surgeons' spinopelvic relationship evaluation behaviors and their experience (P=.017) and academic titles (P=.014) (Tables 4 and 5). In a survey reported by Kong et al[15] last year, 57% of the participants were over the age of 45, and 62% of participants performed more than 50 hip arthroplasties per year. The study suggests that the use of robots or navigation systems in surgeries may be particularly beneficial for young surgeons who are less experienced or still developing their skills. A Canadian study reported a lower incidence of postoperative dislocation in surgeons who performed more than 35 THA surgeries per year compared to those who performed fewer than 35.[16] Additionally, surgeons under 45 years old experienced more complications in THA cases than those aged between 45 and 55 years.[17] These findings suggest that young hip surgeons, in particular, should carefully examine the spinopelvic parameters to avoid complications during THA procedures. In our study, we also observed an inverse correlation between surgeons' experience levels and the complications they encountered (Table 5).

We have not come across another study in the literature that compares the subjectively reported dislocation rates of orthopedic surgeons regarding their preference in assessing spinopelvic relationships. Our research is the first to investigate this topic.

In this study, several limitations need to be acknowledged. Firstly, as our study relies on survey responses, it is susceptible to response bias and self-reporting bias, which can impact the accuracy of the data collected. Secondly, while we obtained responses from a substantial number of registered surgeons, it should be noted that our sample represented approximately 8% of the total registered surgeons in our database, which may introduce selection bias. The survey software we used does not allow us to evaluate the responses to questions with multiple options in separate combinations. Therefore, the combinations used by participants for diagnosis could not be determined and evaluated. Despite these limitations, our study provides valuable insights into the preferences and practices of a substantial number of surgeons in the field, contributing to the existing body of knowledge.

In conclusion, approximately half of orthopedic surgeons in Türkiye plan component placement in primary THA cases by considering the spinopelvic relationship. In order to increase awareness about the spine–pelvis relationship, this issue should be addressed more in training programs and conferences.

Data availability statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics committee approval: This study was approved by the Ethics Committee of Istanbul Medipol University (Approval No: 147 and reference number E-10840098-604.01.01-1303, Date: 16-02-2023).

Informed consent: Written informed consent was obtained from the patientswho agreed to take part in the study.

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