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## Quality of life after pelvic ring fractures: A cross-sectional study

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### ABSTRACT

**Background:** Pelvic ring fractures might have consequences for health-related quality of life (HrQoL). The main purpose of this study was to evaluate patients' HrQoL after a pelvic ring fracture, considering the patients' characteristics. A cross-sectional study was conducted using the EuroQoL-5D (EQ-5D) and the Majeed pelvic score (MPS).

**Methods:** One hundred ninety-five patients (86%) with pelvic ring fractures who were conservatively or surgically treated in a level 1 trauma centre between 2011 and 2015 were included in this study (mean follow up: 29 months, range 6–61). A telephone survey of all patients was conducted. Multiple logistic and linear regression analyses were used for statistical assessment with the EQ-5D and the MPS. The MPS results were split into two age groups with a cut-off point of 65 years.

**Results: EQ-5D:** The mean EQ-5D Visual Analogue Scale (VAS) for Tiles A–C was, respectively, 74 (SD 18), 74 (SD 19) and 67 (SD 21), and the mean EQ-5D index score was, respectively, 0.81 (SD 0.23), 0.77 (SD 0.30) and 0.71 (SD 0.26). Compared with Tile A, patients in Tile C experienced significantly more pain (odds ratio 6.28 (1.73–22.82 95% CI),  $P < 0.01$ ). Clinically relevant differences in EQ-5D scores between Tile A and Tile C were seen in the domains of usual activities and anxiety and in the index score.

**MPS:** The mean MPS of Tiles A–C patients in the <65 group was, respectively, 86 (SD 15), 81 (SD 17), and 74 (SD 16), and in the  $\geq 65$  group, it was, respectively, 69 (SD 15), 68 (SD 15) and 66 (SD 9). In the <65 group, significant differences in MPS results between the Tile groups regarding pain ( $P < 0.01$ ) and the total MPS score ( $P = 0.04$ ) were seen. Neither significant regression coefficients nor clinically relevant differences were found in the  $\geq 65$  group.

**Conclusions:** In conclusion, our study showed that pain was increased in patients with Tile C fractures, compared with Tiles A and B. Furthermore, Tile C patients had significantly lower EQ-5D index and total MPS scores. However, these problems were not seen in the  $\geq 65$  group.

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### Background

Pelvic ring injuries are relatively rare, with an incidence ranging from 3 to 23 per 100,000 persons per year [1,2] Pelvic fractures generally occur as a result of high impact trauma in younger patients, whereas these fractures mostly occur as a result of low-impact falls and osteoporotic changes in elderly patients. [3–7].

Many studies have focused on radiological and functional outcomes after pelvic injury [8–11]. However, only a few studies have focused on health-related quality of life (HrQoL) after pelvic ring injury [12–19]. These HrQoL studies have included only surgically treated pelvic ring fractures or patients with an Injury Severity Score (ISS)  $\geq 16$ . Other HrQoL studies did not include all

Tile-type fractures. Therefore, these studies might not be representative of the total pelvic ring fracture population.

The main purpose of this study was to provide an overview of the HrQoL of all Tile-type pelvic ring fractures and to evaluate HrQoL questionnaire outcomes between different Tile groups. A number of pelvic-specific outcome measures are available; however, none of them have been sufficiently validated [20]. The Majeed pelvic score (MPS) is the most commonly used pelvic-specific outcome instrument [20,21]

The combination of generic and disease-specific instruments provides the opportunity to focus on a specific area without missing important determinants of an individual's health state. [20]. Few studies have combined both types of instruments [17,22,23]

We conducted a cross-sectional study of patients with all types of pelvic ring fractures using generic and pelvic-specific HrQoL instruments, the EuroQoL-5D (EQ-5D) and the MPS. The primary aim in this study was to determine the HrQoL for the different Tile-type fractures with the characteristics considered.

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## Methods

This study was exempted from the scope of the Medical Research Involving Human Subjects Act (WMO) according to our institutional ethics committee. We used our Hospital Trauma Registry (in which all admitted trauma patients are registered) to identify patients 18 years old and older with a pelvic ring injury who were admitted (or transferred within 48 h from other hospitals) to the Elisabeth-Tweesteden Hospital, a level 1 trauma centre, between January 2011 and June 2015. The mechanisms of injury are shown in Table 1.

Patient, incident and admission characteristics were extracted from the Electronic Medical Registration. Additional injuries according to the specific regions, complications during the admission and possible operations were noted. The Abbreviated Injury Scale (AIS-90, update 98) [24], was used to define the anatomy and severity of separate injuries in detail. The AIS code ranges one to six, one being a minor injury and six being maximal (currently untreatable). Minor additional injuries (scale: 1) were not included in the analysis. The Injury Severity Score (ISS) was calculated to assess overall injury severity [25]. The Tile/AO classification was used to classify pelvic ring fractures into type A (A1–A3; stable fractures), type B (B1–B3; rotationally unstable) and type C (C1–C3; rotationally and vertically unstable) [26]. Classifications were performed by the principal investigator and a senior trauma surgeon experienced in the field of pelvic surgery. They reached mutual consensus on all of the cases. Diagnostic data (X-ray and CT if available) and operation reports were used to classify pelvic ring fractures.

Patients who had insufficient knowledge of the Dutch language and those who were deceased at the time of the questionnaire were not included in the study. A telephone survey of all of the included patients was conducted by a medical doctor, the principal investigator.

A total of 272 patients with pelvic ring fractures were referred to our hospital: 170 A, 73 B and 29 C Tile-type fractures. In December 2015, 46 patients had died according to the municipal registration. We did not investigate the causes of death. During the telephone interviews, 10 patients were untraceable (and it was not known whether they were alive or dead), and 2 patients did not want to participate. We excluded 8 patients because of a severe state of dementia, mental illness or a vegetative state. Eleven patients with a follow-up of less than 6 months were excluded due to the possibility of a nonunited pelvic fracture, leaving us with 195 patients (mean follow-up: 29 months, range 6–61) who were available for data collection (Table 2).

### EQ-5D and MPS

The EQ-5D is a questionnaire with five dimensions [27]. In the EQ-5D questionnaire, health is defined along the following five dimensions: mobility, self-care, usual activities, pain or discomfort, and anxiety or depression. Each dimension has the following three levels: no problem, moderate problem, or severe problem. The EQ Visual Analogue Scale (EQ VAS) records the patient's self-rated

**Table 1**  
Mechanisms of injury.

	Tile A, %	Tile B, %	Tile C, %
Fall from same level	29	8	0
Fall from height	18	23	28
High-energy traffic accident	31	47	59
Weapon	1	0	3
Other (e.g. entrapment)	21	22	10
Total	100%	100%	100%

**Table 2**  
Patient characteristics.

	Tile A	Tile B	Tile C
N (%)	101 (52)	67 (34)	27 (14)
Mean ISS (SD)	12 (11)	18 (11)	28 (13)
Gender, N (%)			
Male	47 (46.5)	41 (61.2)	15 (55.6)
Female	54 (54.5)	26 (38.8)	12 (44.4)
Mean age, Yr (SD)	62 (22)	54 (21)	43 (19)
Additional injuries, %			
Region 1, head	27 (26.7)	18 (26.9)	9 (33.3)
Region 2, face	9 (8.9)	6 (9.0)	2 (7.4)
Region 3, neck	2 (2.0)	0	0
Region 4, thorax	19 (18.8)	18 (26.9)	14 (51.9)
Region 5, abdomen	8 (7.9)	10 (14.9)	10 (37.0)
Region 6, spine	8 (7.9)	5 (7.5)	14 (51.9)
Region 7, upper extr.	32 (31.7)	14 (20.9)	10 (37.0)
Region 8, lower extr.	27 (26.7)	21 (31.3)	15 (55.6)
Region 9, unspecified	4 (4.0)	1 (1.5)	0
Operation, N (%)	6 (5.9)	18 (26.9)	22 (81.5)
Complications, %			
Neurological	1	3	3.7
Infection	5	6	18.5
Osteosynthesis failure	1	0	7.4
Mean length of follow up, in months (SD)	28 (16)	30 (16)	33 (16)

state of health on an analogue scale between 0 (worst imaginable health state) and 100 (best imaginable health state). In addition, a scoring algorithm is available by which each health status description can be expressed as a summary score. This summary score, the EQ-5D index, ranges from 1 for full health to 0 for death and can be interpreted as a judgement of the relative desirability of a health status, compared with perfect health. We compared the EQ-5D indices of patients with a pelvic ring fracture and the average EQ-5D index for the general Dutch population (0.87, SD 0.18) [28].

The MPS consists of the following 7 dimensions: pain (30 points), work (20 points), sitting (10 points), standing (36 points total; A: walking aids, 12 points; B: gait unaided, 12 points; C: walking distance, 12 points), and sexual intercourse (4 points). If, for any reason, sexual intercourse was not attempted, a score of four points was given. Majeed et al. [21] suggested cut-offs for excellent, good, fair, and poor results in patients working before their injury (>85, 70–84, 55–69, <55) and in those not working before the injury (>70, 55–69, 45–54, <45) [21]. We updated the terms “(not) working before injury” to the following: “*working patients or patients younger than 65 years old (<65 years)*” and “*retired patients or patients aged 65 years old and older (≥65 years)*”, with maximums of 100 points and 80 points, respectively.

### Data analysis

Descriptive statistics were used to provide an overview of the patient characteristics. The primary outcome in this study was a comparison of the HrQoL for the different Tile-type fractures with the patient characteristics considered. The variables of sex, ISS, age, additional injuries according to the AIS scale, operation and complications were added to the multiple regression model one by one. Variables were included in the final model if they changed the Beta-coefficient by >10%. The 5 EQ dimensions were dichotomized into “no problems” and “problems” (moderate and severe), and multiple logistic regression was performed. The results are presented as odds ratios (ORs) with 95% confidence intervals (CIs). The continuous variables EQ-5D VAS and Index score were

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