



## The benefits of a dedicated orthopaedic trauma room

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**The aim of this comparative study was to examine the possible benefits of a dedicated Orthopaedic Trauma Room (DOTR) and in the care of patients with proximal femur fractures. A retrospective study of all orthopaedic cases with a hip fracture from 2020 to 2022 at CHC Montlegia has been undertaken, the group is compared to patients with the same impairment from 2018-2020 admitted to Saint Joseph/Esperance CHC hospitals (before the merge and the existence of a DOTR). The delay between the arrival at the emergency department and transfer to the operating room, as well as the mortality are evaluated. The length of hospital stay, the operating time, the ASA score, and the Charlson Index were also examined. A total of 734 cases were analysed, with 384 patients pre-DOTR and 350 patients post-DOTR. The 2 groups were comparable in gender, age, fracture type, Asa-score and Charlson Index. The time to the operating room (OR) has been reduced by 14h36 (37h35 vs 23h09,  $p < 0,001$ ). There was no statistical difference detected in mortality after implementation of an DOTR, not after 3 months, neither a year. Novel oral anticoagulants (NOAC) intake showed no significant effect on the mortality postoperatively. The Length of hospital stay in your study was decreased by 1, 54 days ( $p < 0,001$ ).**

**A dedicated orthopaedic trauma room reduced the time to OR and the length of hospital stay. There was no statistical difference detected in mortality after implementation of an DOTR, not after 3 months, neither a year. With a DOTR, the care of trauma patients can be optimized and should become a standard of care.**

**Keywords:** Dedicated orthopaedic trauma room, hip fracture, time to OR, mortality, length of hospital stay.

### INTRODUCTION

Hip fractures are on the rise with an aging European population, the incidence of fractures of the proximal femur will double by 2050<sup>1</sup>. This type of fracture should ideally be treated in the first 24 to 48 hours after the trauma, mortality increases by 20 % after a 48-hour delay<sup>2</sup>. A trauma emergency can be managed in different ways in the operating room (OR): following the elective program, by removing a scheduled case, as an emergency during the night or while waiting for a free spot.

With the implementation of a dedicated trauma room (DOTR), logistical problems as well as

surgeries during the night can be avoided. Patient comfort can be increased with the reduction in waiting time and fasting period for the elderly and complication rate<sup>3</sup>. The fragile patient, as well as the polytrauma and the children can be taken care of as quickly as possible. The patient can therefore be mobilized earlier, and the risk of postoperative complications is reduced<sup>4</sup>. According to published articles, a dedicated orthopaedic

trauma room decreases after-hours orthopaedic surgery, increases capacity without compromising patient safety, decreases operative delay but did not significantly influence 30-day post-operative mortality<sup>5,6,7</sup>.

Featherall et al.<sup>8</sup> demonstrated that a DOTR improves patient flow, increases elective case volumes, reduce morbidity and mortality. With a DOTR, the care of trauma patients can be optimized.

To confirm this hypothesis, a retrospective study of patients with a proximal femur fracture from 2020 to 2022 at CHC Montlegia was undertaken, this group was compared to patients with the same fracture from 2018 to 2020 admitted to Saint Joseph/Esperance CHC hospitals (before the merge and the existence of an DOTR). The aim of this comparative study was to examine the benefit of a DOTR and to evaluate patients with a proximal femur fracture. The duration between the patient's arrival in the Emergency Department and arrival in the operating room, as well as the mortality of patients with a proximal femur fracture were evaluated. The length of stay, operation, the ASA score and Charlson Index were also examined. The Asa-score

is a classification system for assessing the health of a patient before surgery and the Charlson Comorbidity Index<sup>9</sup> predicts a 10-year survival in patients with multiple comorbidities.

**PATIENTS AND METHODS**

A single-centre retrospective cohort study in the hospital CHC MontLegia in Liege (Belgium) included all orthopaedic cases with a hip fracture from 2020 to 2022, the group was compared to patients with the same impairment from 2018 to 2020 admitted to Saint-Joseph/Esperance CHC hospitals. The Saint-Joseph and Esperance CHC Hospital were in Liege, Belgium, they had a capacity of 335 and 171 beds. They have merged and all patients were transferred in March 2020 to MontLegia, a new hospital, with a capacity of 720 beds. With the new hospital the orthopaedic surgeons involved had decided that their 3<sup>rd</sup> operating room will be a DOTR to absorb the flow of trauma cases. We excluded patients if the operation was performed in one of the 2 peripheral hospitals or if they were transferred to our institution.

Two years after the implementation of the DOTR a retrospective study was done. The patients were identified with the operating code for proximal femur fractures. The data was harvested from medical files and completed by phone calls if important data was missing. For the two groups (pre-and post-DOTR), the delay between the arrival at the emergency department and transfer to the operating room, as well as the mortality were evaluated. The length of hospital stay,

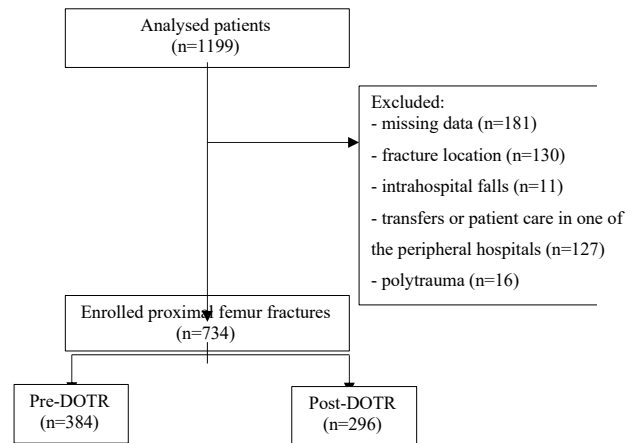


Figure 1. — Flow diagram of patient assessment.

the operating time, the ASA score, and the Charlson Index were also examined.

Patients were divided into two groups, pre-and post-DOTR. Percentages were given with their 95% Confidence Intervals (CI). Continuous variables were compared using analysis of two-tailed t-tests were used for direct comparison between two groups. Pearson chi-square tests were used to compare proportions and percentages. SPSS 19.0 for windows and Microsoft® Excel 2013 was used. A p-value of less than 0.05 denotes a statistical significance.

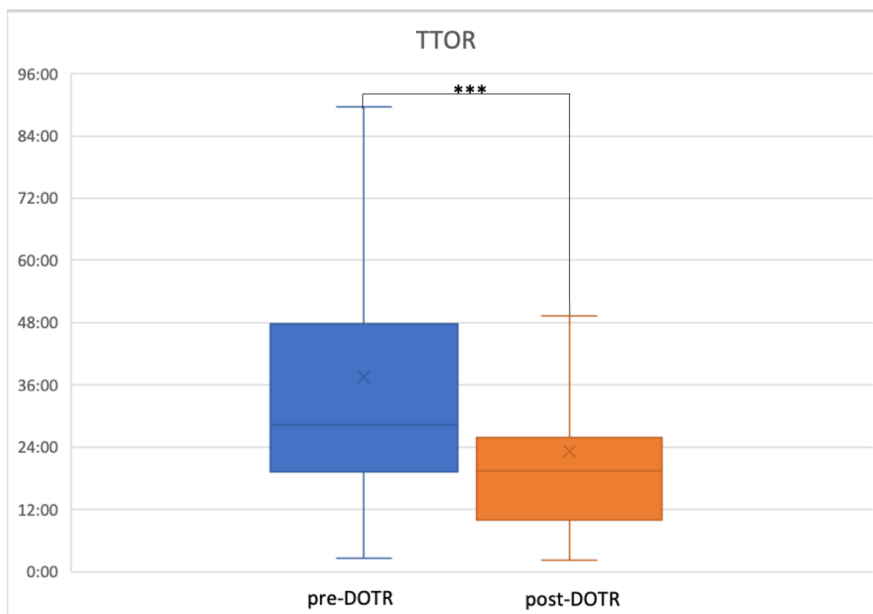
**RESULTS**

A total of 1199 cases were analysed, 734 met the criteria, with 384 patients pre-DOTR and 350 post-DOTR.

Table I. — Demographic and clinical data

	Pre-DOTR N=384	Post-DOTR N=350	P-value
Gender			0,316
Male	105 (27,3%)	78 (22%)	
Female	279 (72,7%)	272 (78%)	
Age			0,452
Average	80,96±11,51	81,57±10,24	
Type of Fracture			0,309
pertrochanteric	226 (59%)	207 (59%)	
basicervical	15 (4%)	7 (2%)	
subcapital	143 (37%)	136 (39%)	
ASA Score	2,3	2,4	0,081
Charlson Index	4,9 (32,5%)	5 (33%)	0,858

DOTR: Dedicated Orthopaedic Trauma Room.



\*\*\* p-value <0,001. DOTR: Dedicated Orthopaedic Trauma Room.

Figure 2. — Time to Operating Room (TTOR)

Table II. — Overall Results

	Pre-DOTR N=384	Post-DOTR N=350	P-value
TTOR	37h35min	23h09min	<0,001
LOHS	11,27days±5,98	9,81days±5,87	<0,001
Mortality			0,918
3 months	49 (13%)	56 (16 %)	
1 year	92 (24%)	85 (24%)	

DOTR: Dedicated Orthopaedic Trauma Room. TTOR: Time to Operating Room. LOS: Length of hospital stay.

In the group pre-DOTR, 228 patients were excluded: 116 to missing data, 65 to the fracture location, 3 to intrahospital falls, 39 to transfers or patient care in one of the peripheral hospitals and 5 patients due to polytrauma.

In the group post-DOTR, 237 patients were excluded: 65 due to missing date, 65 to the fracture location, 8 to intrahospital falls, 88 to transfers or patient care in one of the peripheral hospitals and 11 due to polytrauma (Figure 1).

Regarding patient and injury characteristics, both groups were similar. The 2 groups were comparable in gender, average age, fracture type, Asa-score and Charlson Index (Table I). There was no difference between the fracture types, pertrochanteric, basicervicale and subcapital fractures (p= 0,309) were differentiated. The Asa-score (p=0,081) or Charlson Index (p=0,858) were comparable in the 2 groups.

The time to OR was defined as the duration between the arrival of the patient at the Emergency room and the induction in the OR. With the implementation of an DOTR the time to OR has been reduced significantly (p< 0,001) by 14 hours and 36 minutes (37h35 in pre-DOTR vs 23h09 in post-DOTR) (Table II, Figure 2).

There was no statistical difference detected in mortality after implementation of an DOTR, not after 3 months, neither a year (p=0,918). In the pre-DOTR group after 3 months 49 patients (13%) and after 1 year 92 patients (24%) died. Compared to the post-DOTR group where 56 patients (16%) died in the first 3 months and the number raised to 85 patients (24%) after 1 year. In the 2 groups, patients with NOAC intake

Table III. — Mortality for patients with NOAC treatment

	Pre-DOTR N=384		Post-DOTR N=350	
	Without NOAC N=318	With NOAC N=66	Without NOAC N= 296	Without NOAC N= 54
Mortality				
1 year	71 (23%)	21 (32%)	72 (24%)	13 (24%)
P-value	0,190		0,975	

and without were analysed. There was no difference between the 2 groups, which means that NOAC intake didn't influence the mortality postoperatively (pre-DOTR:  $p=0,190$  and post-DOTR:  $p=0,975$ ) (Table II, III).

The length of hospital stay of patients with a hip fracture pre-DOTR was 11,27 days in average, after the implementation of an DOTR it decreased to 9,81 days. The Length of hospital stay in your study was reduced by 1,54 days ( $p<0,001$ ) (Table II).

## DISCUSSION

The study took place during the covid epidemic, with three waves impacting the operating program, but the DOTR was running during this time, thus the care of hip fractures was not impacted. Batko et al.<sup>10</sup> demonstrated that COVID-19 did not negatively impact perioperative complication rates. The performance of emergency vascular and trauma surgical procedures increased during the pandemic<sup>11</sup>.

The time to OR was decreased by 14 hours and 36 minutes, to an average of 23 hours and 09 minutes. According to Werner et al.<sup>12</sup> 23 hours is below of the averages in other European countries. The pre-DOTR average time was 37 hours which is still in the 48-hours window and could explain that there was no difference in mortality<sup>13,14,15</sup>. The findings of the Hip-attack study<sup>16</sup>, which proved that among patients with a hip fracture, accelerated surgery did not significantly lower the risk of mortality or a composite of major complications compared with standard care also coincide with our findings. Mortality rate varies between 20 to 30 % within the year after hip surgery<sup>15,17,18</sup>. The mortality rate of 24 % at one year postoperatively in our study is situated in this range but in regression compared to the 28,7% of 2016 in Belgium<sup>19</sup>.

NOAC intake didn't influence postoperative mortality, which coincide with the study conducted by Cheung et al.<sup>20</sup>.

With the implementation of an DOTR, emergencies during the night are decreasing significantly, the workflow is improving, there were fewer disruptions to the OR schedule and patient care is improved<sup>21</sup>. Even though the mortality rate didn't improve, the patient comfort did, with the reduction in waiting time and fasting period. Secondly, elective programs are not at risk of being delayed, or even cancelled, by a patient coming from the emergency room. Fewer disruption to the OR schedule means less surgical delays and less surgical complications<sup>22,23</sup>. After-hours surgeries are known to carry a risk of postoperative complications

and can place a strain on the well-being of the surgical team<sup>3,24</sup>. With a DOTR interventions during the night are reserved for vital emergencies.

Length of hospital stay was reduced to 9,81 days which was still very high. One of the main problems is that an elderly person is not capable to return home after a hip fracture. The number of places in convalescence, rehabilitation facilities and care homes are limited and are often the cause of delay. This problem should be addressed sooner than later because it's an excess financial burden. A solution could be an orthogeriatric unit which is also known to decrease mortality postoperatively in the elderly<sup>25</sup>.

Multiple studies have shown that a DOTR can be economically beneficial<sup>8</sup>. JR Lex et al.<sup>26</sup> proved that a DOTR can improve operating room efficiency and can be cost efficient. This is backed up by A. Smith et al.<sup>27</sup>, their study revealed that an implementation of a DOTR increased their arthroplasty case volume.

The study was concentrated on one hospital in Belgium and could not be representative on a national or international level.

## CONCLUSION

A dedicated orthopaedic trauma room reduced the time to OR and length of hospital stay. There was no statistical difference detected in mortality after implementation of an DOTR, not after 3 months, neither a year. With a DOTR, the care of trauma patients can be optimized and should become a standard of care.

*Ethics approval:* This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of CHC Montlegia (14/12/2023/No ° 23/52/1259).

*Consent to participate:* Consent to participate was not necessary because the registry collects data as standard practice on all patients, using a format protecting their identity.

*Consent for publication:* All authors give consent to publish.

*Conflict of interest:* The authors declare no competing interests

*Funding:* There is no funding source

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