TRIGEN◊ INTERTAN◊ Intertrochanteric Antegrade Nail: clinical and economic benefits in the treatment of intertrochanteric hip fractures

Discussion points

- Treatment of intertrochanteric hip fractures represents a substantial proportion of the high overall clinical and economic burden of hip fracture[1,2]
- TRIGEN INTERTAN has shown improved biomechanical performance[3–5] and clinical outcomes, including revision/reoperation rate,[6] compared with other intramedullary (IM) nails in the treatment of intertrochanteric fractures
- In an economic analysis, TRIGEN INTERTAN has been associated with reduced per patient hospital costs, when compared with alternative IM nails[7]

The clinical and economic burden of hip fractures

Though the incidence of hip fractures is relatively low, accounting for 15% of fractures treated, they are associated with high costs;[8] for example, in the Netherlands, hip fractures have been estimated to contribute 53% of osteoporosis-related fracture costs.[8] Hip fractures have a high mortality rate, even when surgically treated,[9–11] and are associated with high rates of morbidity, with considerable potential impact on patients' mobility and daily living.[12,13] The likelihood that a hip fracture patient will recover to their pre-fracture level of function is less than 50%.[13] Moreover, many patients require reoperation due to complications,[10] contributing to the already substantial economic burden associated with hip fractures (Figure 1).[14,15]

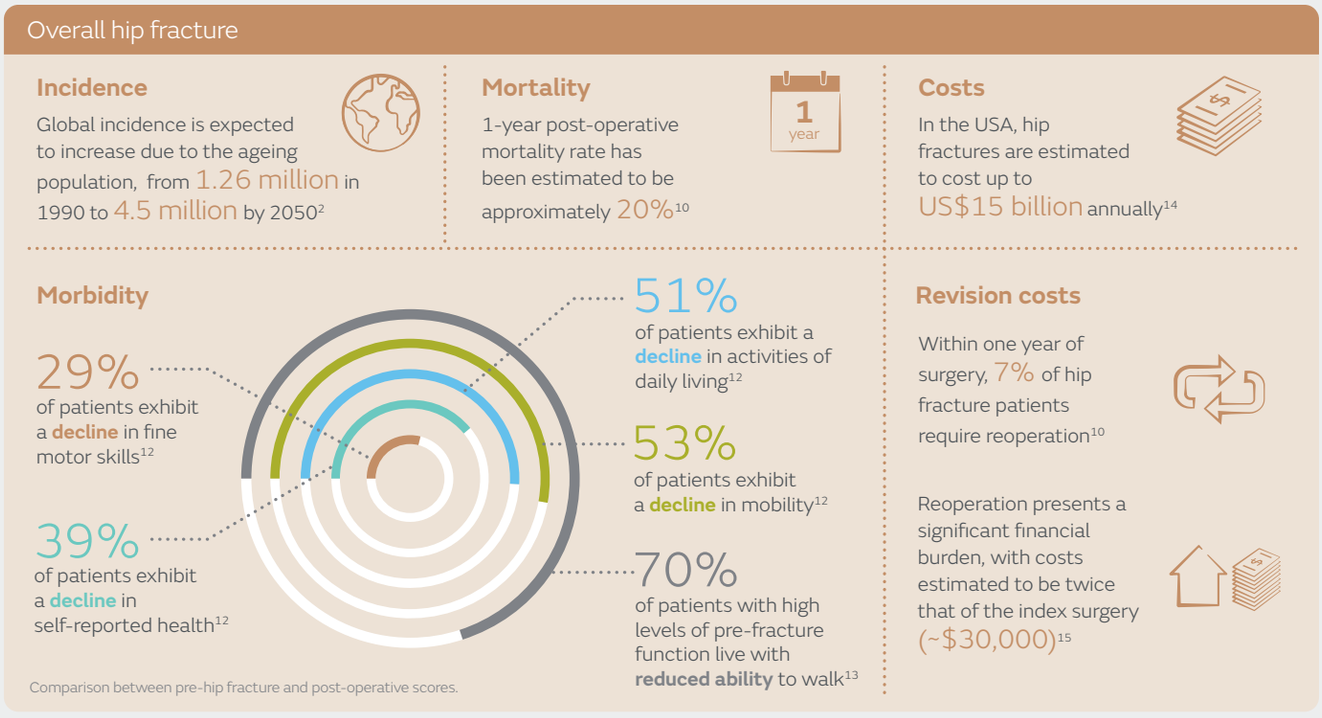


Figure 1. The clinical and economic burden of hip fracture

Intertrochanteric hip fractures

Intertrochanteric fractures are hip fractures that occur between the greater and lesser trochanters of the proximal femur.[14] They comprise a large proportion of both the overall clinical burden and total direct medical costs relating to hip fractures (Figure 2).[1]

Figure 2. The contribution of intertrochanteric hip fracture to overall hip fracture burden

✚ Evidence in focus

Treatment of intertrochanteric hip fractures

The standard of care for intertrochanteric fractures is surgical fixation, unless contraindicated,[16] with the aim of achieving early mobilisation and facilitating earlier rehabilitation and functional recovery.[17] A number of different surgical treatment approaches can be used, with the procedure primarily influenced by fracture pattern:[16,18]

- Intramedullary nails are the most commonly used fixation method for intertrochanteric fractures in North America,[19] with a range of types available including TRIGEN◊ INTERTAN◊ Intertrochanteric Antegrade Nail, Gamma3™ Nailing System (Stryker, Michigan, USA), TFN-ADVANCED™ Proximal Femoral Nailing System (TFNA™; DePuy Synthes, Pennsylvania, USA) and Proximal Femoral Nail Antirotation (PFNA™; DePuy Synthes, Solothurn, Switzerland)
- Dynamic or sliding hip screws may be used for stable fractures but have a greater risk of failure in older patients with a lower bone density,[18,20] and have limitations in patients with unstable fractures[21,22]
- Hemiarthroplasty, an operation where the femoral head alone is replaced with a prosthesis, typically has higher complication rates but may be used for a small number of frail, elderly patients.[18] For example, it is recommended for patients with ipsilateral hip osteoarthritis, unstable fracture patterns where bone quality is poor, and failed internal fixations[18]

TRIGEN INTERTAN: An IM nail offering improved performance over comparator devices

TRIGEN INTERTAN differs from traditional single-screw IM devices in its use of two Integrated Compression Screws and in other aspects of its design:

- The dual-screw design is intended to maintain the stability of the femoral head by pulling it tightly to the hip bone and preventing it from rotating out of position[5,23]
- The trapezoidal shape of the implant is designed to provide a tighter fit in the hip bone and therefore additional strength where forces tend to be highest[24]
- Finally, the lower tip of the nail is less rigid, and designed to reduce stress on the hip bone

TRIGEN INTERTAN has been shown to result in improved performance in biomechanical testing compared with other IM nails (Figure 3).[3–5]

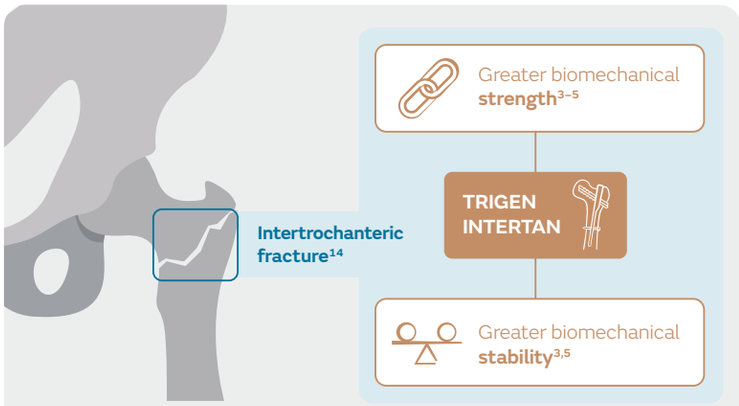


Figure 3. Findings of studies comparing the biomechanical properties of TRIGEN INTERTAN with PFNA™, Gamma3™, and IMHS◊ CP Clinically Proven Intramedullary Hip Screw

TRIGEN INTERTAN has the potential to improve clinical outcomes in unstable intertrochanteric fractures

A meta-analysis of studies reporting on adult patients with unstable intertrochanteric fractures has permitted the direct comparison of clinical and functional outcomes with TRIGEN INTERTAN and other IM nails including Gamma3™ and PFNA™ (Figure 4).[6]

TRIGEN INTERTAN demonstrated reductions in the risk of revision/reoperation, implant-related failure, and hip and thigh pain when compared with other IM nails (Figure 4). Together, these findings highlight the opportunity to improve outcomes for patients through the use of TRIGEN INTERTAN in unstable intertrochanteric fractures.

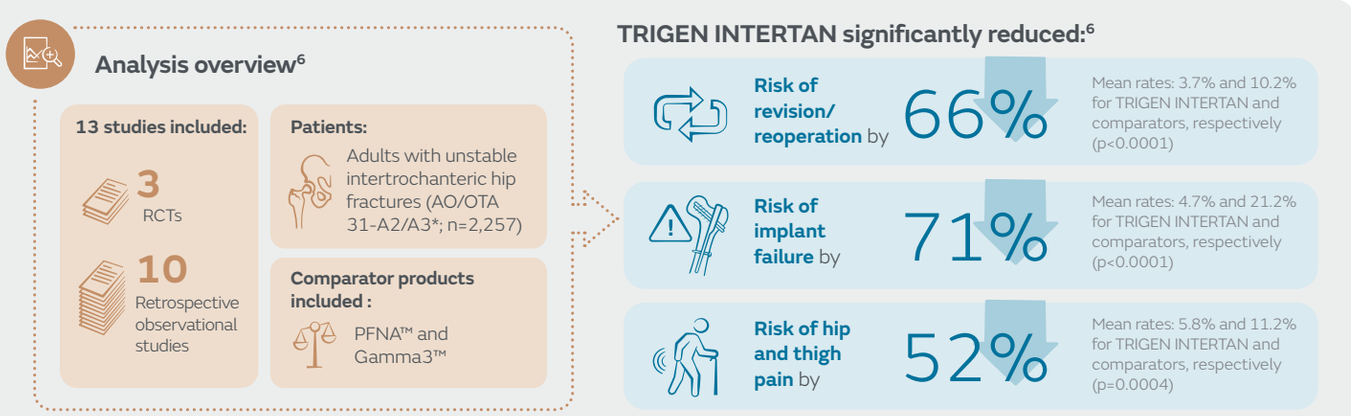


Figure 4. Key findings from a systematic literature review and meta-analysis evaluating TRIGEN INTERTAN and other IM nails in unstable intertrochanteric fractures

*AO/OTA 31-A2/A3 fractures include unstable intertrochanteric fractures (AO/OTA 31-A2) and reverse obliquity fracture or fractures involving the lateral cortex (AO/OTA 31-A3), according to the AO Foundation/Orthopaedic Trauma Association classification system.
Percentage risk reductions were calculated using proportional or continuous meta-analyses (according to whether data were continuous or categorical), which enabled comparison of TRIGEN INTERTAN and comparators and calculation of relative risk. Mean rates are based on weighted mean values, calculated using a meta-analysis of single means to calculate an overall mean from included studies.

✚ Evidence in focus

TRIGEN◊ INTERTAN◊ reduces hospital costs compared with other IM nails for the treatment of intertrochanteric hip fractures

The US Premier database comprises data from over 700 hospitals with approximately one billion patient encounters,[25] and is broadly representative of the US hospital experience.[26] Using this database, all inpatient costs were compared for patients who:

- Were admitted with unstable intertrochanteric fractures – identified using ICD-10 diagnosis code S72.14 and a recorded Diagnosis-Related Group (DRG) of 480, 481 or 482 (Figure 5) – between January 2017 and September 2019
- Were treated using either TRIGEN INTERTAN (n=1,585), Gamma3™ (n=5,538) or TFNA™ nails (n=7,078)

Departmental costs were evaluated for the most common of the three DRGs (481), which includes patients with hip or femur fractures (except major joint) and complications or comorbidities. This group excludes patients who do not have complications or comorbidities, as well as those with major complications and comorbidities, and thus, overall, represents cases of moderate severity. [27]

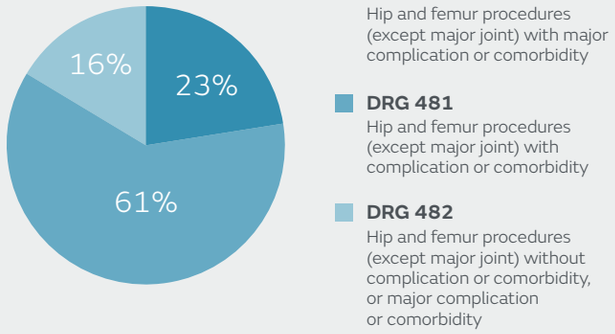


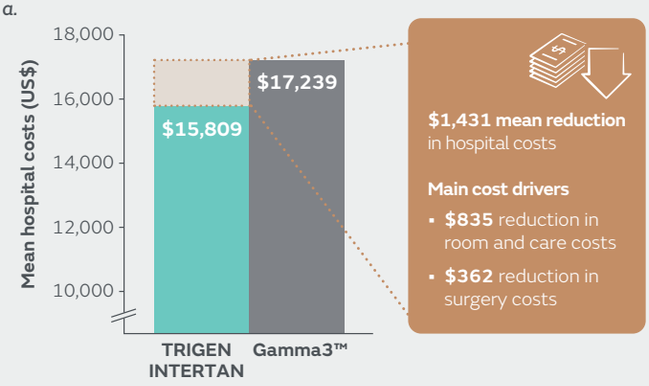
Figure 5. Proportion of patients identified in US PREMIER database stratified by DRG

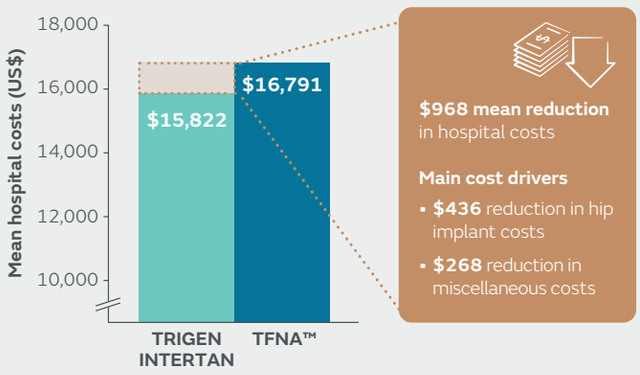
Pie chart presents rounded figures. Figures to 1 decimal place for each analysis are as follows: DRG (TRIGEN INTERTAN vs Gamma3™; TRIGEN INTERTAN vs TFNA™): DRG 480 (22.6%; 22.6%); DRG 481 (61.1%; 61.7%); DRG 482 (16.3%; 15.7%).

In a matched comparison of Gamma3™ and TRIGEN INTERTAN nails, TRIGEN INTERTAN was associated with a mean $1,431 reduction in hospital costs per patient (Figure 6a).[7] TRIGEN INTERTAN also resulted in mean hospital cost savings of $968 per patient in a matched comparison with TFNA™ nail (Figure 6a).[7] Furthermore, this analysis highlighted that the cost of the IM nail implants themselves represent <15% of the total hospital costs (Figure 6b).[7]

TRIGEN INTERTAN was also cost saving compared with Gamma3™ and TFNA™ for DRGs 480 and 482. Mean hospital cost savings compared with Gamma3™ were $1,637 and $1,176 for DRGs 480 and 482, respectively. Similarly, mean hospital cost savings compared with TFNA™ were $543 and $693 for DRGs 480 and 482, respectively.[7]

a.





b.

Cost category	TRIGEN INTERTAN, $ (%)	Gamma3™, $ (%)
Hip implant	1,882 (11.9)	1,554 (9.0)
Other supply (medical/surgery, other central supply costs)	2,189 (13.8)	2,536 (14.7)
Surgery (time and other surgery costs)	2,827 (17.9)	3,188 (18.5)
Room and care	4,766 (30.2)	5,601 (32.5)
Pharmacy, laboratory, PT/OT	1,615 (10.2)	1,688 (9.8)
Miscellaneous*	2,529 (16.0)	2,672 (15.5)
Total	**15,809**	**17,239**

Cost category	TRIGEN INTERTAN, $ (%)	TFNA™, $ (%)
Hip implant	1,885 (11.9)	2,322 (13.8)
Other supply (medical/surgery, other central supply costs)	2,192 (13.9)	2,123 (12.6)
Surgery (time and other surgery costs)	2,832 (17.9)	2,895 (17.2)
Room and care	4,767 (30.1)	4,950 (29.5)
Pharmacy, laboratory, PT/OT	1,615 (10.2)	1,702 (10.1)
Miscellaneous*	2,531 (16.0)	2,799 (16.7)
Total	**15,822**	**16,791**

Figure 6 a. Comparison of mean hospital costs between TRIGEN INTERTAN and other IM nails. b. Comparison of mean hospital costs stratified by cost category between TRIGEN INTERTAN and other IM nails. All analyses based on DRG 481, which includes patients with hip and femur fractures (except major joint) with complication or comorbidity

Due to rounding, mean costs data may not exactly equal total values and percentages may not equal 100%. *Miscellaneous costs include costs associated with transfusion medicine, diagnostic imaging, recovery room services, administrative fees, and other miscellaneous costs.

✚ Evidence in focus

Conclusions

- Intertrochanteric fractures represent a **substantial proportion of the overall clinical and economic burden of hip fracture**[1]
- The design features of TRIGEN◊ INTERTAN◊ help to improve **biomechanical strength**[3–5] and **stability**[3,5] over other IM nails
- TRIGEN INTERTAN is associated with **significant improvements in clinical outcomes compared with other IM nails**, including revision/reoperation rate, implant failure and hip and thigh pain[6]
- TRIGEN INTERTAN has the potential to generate **substantial savings by reducing hospital costs**[7]

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