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EVALUATION OF THE REPRODUCIBILITY OF THE TRONZO CLASSIFICATION FOR INTERTROCHANTERIC FRACTURES OF THE FEMUR IN AN ORTHOPEDIC SERVICE OF A HOSPITAL IN IBAGUÉ, COLOMBIA

EVALUACIÓN DE LA REPRODUCIBILIDAD DE LA CLASIFICACIÓN DE TRONZO PARA FRACTURAS INTERTROCANTÉRICAS DE FÉMUR EN UN SERVICIO DE ORTOPEEDIA DE UN HOSPITAL DE IBAGUE, COLOMBIA

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ABSTRACT

Introduction: Hip fractures are a pathology of traumatic origin that generates a high impact on public health. The objective is to evaluate the interobserver reproducibility of the Tronzo classification for intertrochanteric fractures. **Methods:** Observational, analytical and retrospective study carried out in Ibagué - Colombia, 48 hip radiographs were analyzed, classied by 10 observers, among specialists and training personnel, using the Tronzo classification. Interobserver reproducibility is assessed using the kappa concordance coefficient. **Results:** Among all those observed in the study, there is greater agreement in the identification of intertrochanteric fractures of lesser and greater severity (Tronzo I and V), the main exponents of this agreement are the most experienced staff, the staff in training, with intermediate experience they agree when identifying those of intermediate severity and for those with less experience the concordance becomes evident when evaluating the intermediate grades. **Conclusion:** The concordance increases with the experience for the identification of the types with high complexity. This classification is not suitable for clinical practice, another system is necessary for this type of fracture in clinical conduct.

Keywords: Intertrochanteric fractures; Orthopedics; Traumatology; Tronzo classification. (Source: MESH-NLM)

RESUMEN

Introducción: Las fracturas de cadera son una patología de origen traumático que genera un alto impacto en la salud pública. El objetivo es evaluar la reproducibilidad interobservador de la clasificación de Tronzo para fracturas intertrocantéricas. **Métodos:** Estudio observacional, analítico y retrospectivo realizado en Ibagué - Colombia, se analizaron 48 radiografías de cadera, clasificadas por 10 observadores, entre especialistas y personal en formación, utilizando la clasificación de Tronzo. La reproducibilidad interobservador se evalúa mediante el coeficiente de concordancia kappa. **Resultados:** Entre todos los observados del estudio existe mayor acuerdo en la identificación de fracturas intertrocantéricas de menor y mayor gravedad (Tronzo I y V), los principales exponentes de este acuerdo son el personal de mayor experiencia, el personal en formación, con experiencia intermedia están de acuerdo al identificar a los de gravedad intermedia y para los que tienen menos experiencia la concordancia se hace evidente a la hora de evaluar los grados intermedios. **Conclusión:** La concordancia aumenta con la experiencia para la identificación de los tipos con alta complejidad. No es adecuado para la práctica clínica esta clasificación, es necesario otro sistema para este tipo de fracturas en las conductas clínicas.

Palabras clave: Fracturas intertrocantéricas; Ortopedia; Traumatología; Clasificación de Tronzo. (Fuente: DeCS-BIREME)

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INTRODUCTION

Hip fractures represent a pathology with a high impact on public health, being an important cause of mortality and morbidity in the elderly population⁽¹⁾. Approximately 300,000 hip fractures occur in the United States each year with a projected increase due to increased life expectancy. Regarding Colombia, it has been found that between 8,000 and 10,000 hip fractures occur annually, speaking only of those that occur in women, with osteoporosis being the main risk factor in this group, older than 60 years^(2,3).

The anatomical location of the proximal femur is divided into head, neck and intertrochanteric regions; fractures in this area can be classified as intracapsular and extracapsular, depending on the joint^(4,5). Intertrochanteric fractures represent an important 50% of proximal femur fractures, mostly associated with low-energy traumatic mechanisms in the elderly, considered as a product of metabolic pathologies that can affect bone quality⁽⁶⁾.

Throughout scientific development, different treatments have been proposed for the management of hip fractures, including conservative and surgical management, the incidence of postoperative complications is high and entails a complex rehabilitation period and mortality per year corresponding to the value already mentioned. However, without surgery, mortality is 50%, the results are less promising, so surgical treatment is the standard treatment for older adult patients^(7,8,9). Regarding the surgical decision, it has several supports, among them, the patient's comorbidities, her anesthetic risk, and the type of fracture line (stable or unstable)⁽¹⁾.

The classifications allow establishing the best intraoperative procedure according to the patient's injury, so it is necessary to have an intra and interobserver concordance when using them as a therapeutic reference^(10,11). It is for this reason that the objective was to evaluate the interobserver reproducibility of the Tronzo classification for intertrochanteric fractures to establish the suitability of its clinical application and the variability according to the level of experience.

METHODS

Study design type and área

Observational, analytical, retrospective and cross-sectional study in a service of a health institution III level of complexity in Ibagué, Colombia, aimed to evaluate the interobserver reproducibility of the Tronzo classification for intertrochanteric fractures through the kappa concordance coefficient to establish the suitability of its clinical application and the variability according to the level of experience.

Population and sample

Patients with initial or intraoperative diagnosis of intertrochanteric fractures who received care and surgical treatment in the period from 2019 to 2020. An acceptance sampling of variables was carried out, which met the eligibility criteria: Age greater than or equal to 60 years, initial diagnostic image, diagnosed proximal femur fractures: intertrochanteric fractures throughout the hospital stay (Primary or intra-surgical diagnosis), fractures with a low-energy trauma mechanism, patients operated on in the institution, admitted to the service from the emergency room, and patients treated by the service between 2019 and 2020.

Patients were excluded: under 60 years of age, without initial X-ray of the fracture, non-intertrochanteric proximal femur fractures and non-proximal femur fractures, pathological or high-energy fractures, deceased or referred outside the institution prior to the surgical procedure, with management conservative, dissent from the surgical procedure, admissions that did not correspond to an emergency (surgery scheduled from an outpatient clinic) and, finally, a date other than 2019 and 2020.

Variables and instruments

The STROBE Declaration was used, for which the specialty books on which the pre- and post-surgical diagnoses were based were reviewed, the internal census of the Orthopedics service carried out by the specialty in the Google tool, Calculation Sheets in Drive and reviewed the diagnoses with ICD-10 codes S700, S720, S721, S727, S728, S729, S798, S799, then each of the medical records (MR) of the patients was reviewed applying the eligibility criteria. Each of the data sources





was refined, finally having accessibility to 56 MRs, of which 24 corresponded to the year 2019 and 32 to 2020, it was decided to leave the same number of elements to analyze, for a total of 48 Mrs.

Procedures

The radiographs obtained from each of the HCs were classified according to the Tronzo classification, by 10 observers: six specialists, a second and third year resident, and 2 final year medical students, who were completing an elective rotation in the service. All the observers received orientations at the moment of the evaluation of the radiographs, not previously knowing to which study they were summoned. Initially, the Tronzo classification was shown and the format of the collection instrument was explained. The radiographs of the fractures were presented as slides in Power Point® software, in sequence, independent of each other and individually numbered from one to forty-eight, each image was analyzed for a maximum of 30 s. After data collection, the reproducibility of the specialists and the reliability of said reproducibility were evaluated and a comparison was made with the personnel in training.

Statistical analysis

The collected data were statistically analyzed using the kappa concordance test. For statistical analysis, Excel® and IBM SPSS® version 25 programs were used.

Ethical aspects

This research respected the rights and principles enshrined in the Declaration of Helsinki and was classified as minimal risk according to resolution 8430 of 1993 of the Colombian Ministry of Health, as well as the Research Ethics Committee of the Hospital Pablo Tobón Uribe.

RESULTS

56 medical records were analyzed, of which 24 corresponded to the year 2019 and 32 to 2020, it was decided to leave the same number of elements to be analyzed, for a total of 48 medical records. The radiographs obtained from each of the HCs were classified according to the Tronzo classification, by 10 observers: 6 specialists, 1 second and third year resident, and 2 final year medical students who were completing elective rotation in the service, taking into account all observers. According to the results observed in Table 1, the highest concordance was obtained when evaluating the presence of Tronzo 1 ($\kappa = 0.51$) and Tronzo 5 ($\kappa = 0.31$) hip fractures, which indicates that there is a greater concordance in the radiological identification of hip fractures of lesser and greater degree of severity.

Table 1. Concordance in the radiological identification of hip fractures for the entire group of observers.

CLASSIFICATION:	KAPPAP	P-VALUE
Tronzo 1	0.51	0.0001
Tronzo 2	0.21	0.0001
Tronzo 3	0.19	0.0001
Tronzo 4	0.10	0.0001
Tronzo 5	0.31	0.0001





When observers were divided into groups of orthopedic and trauma specialists versus trainees, we found the following results: for specialists, the overall assessment of hip fractures reflects an agreement of 0.27 but this is higher when assessing only between the hip peaks of lesser severity presenting a kappa of 0.53 and those of greater severity with a result of 0.58 for this index; results that when contrasting with the training staff

(orthopedic residents and final year students with orientation in orthopedics) a total value of 0.22 is found, but there is good agreement between the identification of low severity fractures with a kappa of 0.59 for those categorized as Tronzo 1, however, not having found a good identification for the group in fractures with a higher degree of severity (Table 2).

Table 2. Concordance according to the degree of academic training.

ORTHOPEDISTS	KAPPAP	P-VALUE
Tronzo 1	0.53	0.0001
Tronzo 2	0.23	0.0001
Tronzo 3	0.24	0.0001
Tronzo 4	0.17	0.0001
Tronzo 5	0.58	0.0001
all classifications	0,27	0.0001

PHYSICIANS IN TRAINING	KAPPAP	P-VALUE
Tronzo 1	0.59	0.0001
Tronzo 2	0.28	0.0001
Tronzo 3	0.22	0.0001
Tronzo 4	0.08	0.0001
Tronzo 5	0.03	0.0001
all classifications	0.22	0.0001

Finally, when all the groups observed are considered to evaluate the concordance in the radiological identification of hip fractures by Tronzo classification, the best concordance is obtained for specialist doctors when determining Tronzo 1 fractures, with a kappa of 0.53 and the Tronzo 5 with an index of 0.58, orthopedic residents show a kappa of 0.32 for all types of fracture, and the degree of concordance is higher for the Tronzo 1

(kappa = 0.55) and Tronzo 3 (kappa = 0.49). Finally, for interns with special training in orthopedics, there is only a concordance of 0.10 for all types of fracture, however, when we evaluate according to the different categories, there is a good identification among the subgroup to identify less severe fractures having a kappa of 0.48 for impact hip fractures 1 (Table 3).





Table 3. Concordance in the identification of hip fractures in the different subgroups.

ORTHOPEDISTS	KAPPAP	P-VALUE
Tronzo 1	0.51	0.0001
Tronzo 2	0.21	0.0001
Tronzo 3	0.19	0.0001
Tronzo 4	0.10	0.0001
Tronzo 5	0.31	0.0001

RESIDENTS	KAPPAP	P-VALUE
Tronzo 1	0.55	0.000
Tronzo 2	0.02	0.883
Tronzo 3	0.49	0.001
Tronzo 4	0.20	0.167
Tronzo 5	-0.04	0.763
all classifications	0.32	0.0001

PHYSICIANS IN TRAINING	KAPPAP	P-VALUE
Tronzo 1	0.487	0.001
Tronzo 2	0.289	0.045
Tronzo 3	0.061	0.671
Tronzo 4	-0.008	0.954
Tronzo 5	-0.157	0.278
all classifications	0.105	0.17



DISCUSSION

The classifications work as a source for determining clinical behaviors, influencing therapeutic decision-making, so their validity becomes important. University hospitals have personnel in training between undergraduate and postgraduate, this subgroup being in most cases in the mentioned scenario, the first contact with the patient by specialty, therefore, having concordance of concepts among all the personnel involved with the patient with the same pathology, it becomes relevant. Landis and Koch proposed in 1977 a scale for interpreting the kappa value where they considered acceptable those values greater than or equal to (0.40) and excellent those greater than 0.75 once the concordance had been applied⁽¹³⁾.

There are different studies in orthopedics where the classifications have been subjected to the evaluation of their reproducibility, an example of this is the great interobserver variability demonstrated by La Villa et al. on the Neer classification for proximal humerus fractures with concordance of (0.18)⁽¹⁴⁾. The authors Neto, J. B. A et al. had a concordance of (0.58) for the Fraser classification and 0.46 for Blake & McBryde, in floating knee, which was interpreted as acceptable⁽¹⁵⁾.

The Tronzo classification was evaluated in a study published in the Revista Brasileira de Ortopedia, Oliveira, F.A.S. et al. where they assessed its reproducibility, this being moderate (0.44). A common factor of the mentioned studies was the inclusion of personnel in training, residents of the specialty, however in our searches in the Medline and NCBI databases we did not find any study that took into account the evaluation of the concordance index of the classification of Tronzo that included, in addition to specialists and residents, undergraduate students.

As it could be observed, the degree of concordance of the classifications in Orthopedics varies, despite its relevance, there is little evidence of the assessment of the concordance that exists between the different levels of medical specialization, residents, general practitioners and doctors in training. despite its importance in training for the proper referral of patients

⁽¹⁶⁾.

In our study, we identified that from the Tronzo classification, type I fracture had the highest concordance in all subgroups (0.48 - 0.59), which corresponds to an acceptable variability of concepts among the observed observers. This type of fracture corresponds to stable fractures, however when there is suspicion of comminution of the posteromedial wall and/or suspicion of lesser trochanter involvement, it is when the concordance becomes lower (0.02 - 0.06) as the worst results; but if the total group is looked at separately, it has an adequate concordance for the group of residents (0.49), this may be due to the challenge involved in recognizing the commitments of the femur mentioned as criteria of instability of the intertrochanteric fracture such as Tronzo II and III . However, for those cases of totally unstable IV and V fractures, it is the person with the most training who represents an adequate variability (0.58).

This is explained by the influence of experience in the field of specialists and staff in training by rank (residents over doctors in training). An unexpected result of this study was the poor concordance of specialists with Tronzo II and III fractures, since in general what is expected from greater training together with experience is greater reliability. One limitation of our study is the absence of an interobserver assessment that allows evaluating the operative options in terms of the clinical and/or surgical behavior to be performed for each subtype of the classification.

CONCLUSIÓN

The Tronzo classification presented little concordance in fractures II to IV, and in the cases of fractures I and V the reproducibility is greater. The identification for the types of high complexity fractures was better in orthopedic specialists with more experience. However, this is not the same for staff in training by rank (residents over doctors in training) because the best agreement was for the first types I, IV. Therefore, the Tronzo classification does not adequately fit the criteria for an adequate classification for clinical practice in this hospital.



**Declaration of authorship contributions:**

Conception and design of the article; Collection of results; Data analysis and interpretation; Writing of the article; Critical review of the article; Approval of the final version.

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