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# Do surgical and conservative treatment for fracture of the middle third of the clavicle in adults have the same result?

*Tratamento cirúrgico e conservador para fratura de terço médio da clavícula em adultos têm o mesmo resultado?*

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**ABSTRACT**

Introduction: Clavicle fracture is one of the most common, with the most affected location being its middle third. In the past, fractures in this location were almost always treated conservatively; however, surgical treatment has become popular. Which treatment modality is best? It is a controversial topic.

Objective: To compare consolidation and complications between surgical and conservative treatment for fractures of the middle third of the clavicle.

Methods: Retrospective, observational, cross-sectional and individual study, carried out based on the analysis of 88 medical records. Data were collected on fracture healing time, as well as treatment complications, comparing conservative treatment with surgical treatment.

Results: Delayed consolidation was present in 5 of the 45 patients in the conservative treatment group, while none of the 43 patients treated surgically presented the complication. No statistically significant differences were found in the occurrence of pseudarthrosis, aesthetic defects, misalignment, residual pain and functional loss.

Conclusion: No relevant differences were found between the results of surgical and conservative treatment, except in the occurrence of delayed consolidation, in which surgical treatment was advantageous.

KEYWORDS: Clavicle fracture. Surgical treatment. Conservative treatment.

**RESUMO**

Introdução: A fratura de clavícula é das mais comuns, sendo que o local mais acometido é o seu terço médio. No passado, fraturas desse local eram tratados quase sempre de forma conservadora; porém, o tratamento cirúrgico tem se popularizado. Todavia, qual a melhor modalidade de tratamento é tema controverso.

Objetivo: Comparar a consolidação e complicações entre o tratamento cirúrgico e o conservador para a fratura de terço médio da clavícula.

Métodos: Estudo retrospectivo, observacional, transversal e individuado, realizado a partir de análise de 88 prontuários. Foram coletados dados sobre o tempo de consolidação das fraturas, bem como de complicações do tratamento, comparando o tratamento conservador com o cirúrgico.

Resultados: O retardo de consolidação esteve presente em 5 dos 45 pacientes do grupo de tratamento conservador, enquanto nenhum dos 43 pacientes tratados cirurgicamente apresentou a complicação. Não foram achadas diferenças estatisticamente significativas na ocorrência de pseudartrose, defeito estético, desalinhamento, dor residual e perda funcional.

Conclusão: Não foram encontradas diferenças relevantes entre o resultado do tratamento cirúrgico e conservador, exceto na ocorrência de retardo de consolidação, na qual o tratamento cirúrgico ficou em vantagem.

PALAVRAS-CHAVE: Fratura da clavícula. Tratamento cirúrgico. Tratamento conservador.

| | Conservative | Surgical |
|---|---|---|
| Average | 11.8 weeks | 12.3 weeks |
| Standard deviation | 6.3 weeks | 5.5 weeks |
| Median | 12 weeks | 12 weeks |
| Minimum | 2 weeks | 5 weeks |
| Maximum | 32 weeks | 40 weeks |

*Consolidation time (weeks)*

**Central Message**

*Clavicle fracture is common, and the most affected site is its middle 1/3. In the past, fractures of this site were almost always treated conservatively; however, surgical treatment has become popular. However, which is the best treatment modality is a controversial topic. This article seeks to collaborate with the theme by presenting a survey in the comparison between conservative and surgical treatment.*

**Perspective**

*No relevant differences were found between the results of surgical and conservative treatment in the approach to 1/3 midclavicular fractures, except in the occurrence of delayed union, in which surgical treatment was an advantage. Thus, it is necessary to use other criteria for the indication of one or the other method taking into account mainly the age group and any morbidities that the patients present, regardless of the group they belong to.*

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## INTRODUCTION

Clavicle fractures are common injuries and constitute 2.6% of all fractures in adults, most of which occur in the middle third. They are more common in young men and are mainly caused by traffic accidents and falls.[1]

Traditionally, clavicle fractures were treated non-surgically, with immobilization of the arm. However, recently surgical treatment has become popular, and the most common method used is open reduction with plate fixation. Older studies have reported better results with conservative treatment; However, the most recent ones point to the opposite. That said, what is the ideal approach for the treatment of clavicle fractures remains a controversial issue.[2]

Complications in treatment, such as deformities and pseudoarthrosis, can negatively affect the patient's quality of life. There is still no consensus on the preferable form of treatment of these fractures, with an insufficient number of comparative studies between surgical and conservative treatment.

Thus, the objective of this study was to compare the presence of consolidation and complications between surgical and conservative treatment for fractures of the middle third of the clavicle and to study whether the patient profile modifies the incidence of complications of surgical treatment in relation to conservative treatment.

## METHOD

This study was approved by the Human Research Ethics Committee of the Faculdade Evangélica Mackenzie do Paraná, Curitiba, PR, Brazil – CAAE: 65490222.5.0000.0103, Opinion number: 5.804.760. It was retrospective, observational, cross-sectional, and individualized, based on the analysis of patient records at the Mackenzie Evangelical University Hospital, Curitiba, PR, Brazil. A total of 88 medical records were collected, searched from the International Classification of Diseases and belonging to the period from January 2018 to December 2022.

The medical records of patients with closed fractures of the middle 1/3 of the clavicle aged 18 years or older were used. The fracture healing time was analyzed and the presence or absence of delayed healing, pseudoarthrosis, misalignment, aesthetic defect, functional loss, and chronic residual pain was verified.

The collected data were placed in a spreadsheet and accessed exclusively by the researchers, who committed themselves by the Data Use Confidentiality Agreement to maintain the anonymity and privacy of the patients.

Considering that the patients studied had already been discharged and were no longer being followed, several of whom came from other cities, it was not feasible to contact them, and taking into account the methodology used in the study, it was proposed to waive the Informed Consent Form.

The inclusion criteria were patients with a closed fracture of the middle 1/3 of the clavicle, aged 18 years or older, treated in the aforementioned period. The exclusion factors were patients with open clavicle fractures, pathological fractures, concomitant fractures of the shoulder girdle, children under 18 years of age, and patients with medical records with insufficient information to contribute to the research.

### Statistical analysis

The data obtained were entered into a Google Sheets spreadsheet for analysis. Means and standard deviations, median and minimum and maximum values, and percentages and frequencies were calculated, and Student's t-test and chi-square tests with $p<0.05$ for significance. Null hypothesis (H0) assumed that there was no significant difference between the means of the 2 samples and the alternative hypothesis (H1) that assumed there was a significant difference between them.

## RESULT

Of the medical records analyzed, 88 fit the inclusion criteria. Mean, median, standard deviation, minimum and maximum of the 2 groups were compared in terms of consolidation time (Table 1).

**TABLE 1** — Consolidation time (weeks)

| | Conservative | Surgical |
|---|---|---|
| Average | 11.8 weeks | 12.3 weeks |
| Standard deviation | 6.3 weeks | 5.5 weeks |
| Median | 12 weeks | 12 weeks |
| Minimum | 2 weeks | 5 weeks |
| Maximum | 32 weeks | 40 weeks |

To assess whether there was a statistically significant difference between the mean days of conservative and surgical treatment, Student's T was used, with p=0.6. The value of t totaled -0.4047. Therefore, this value is not within the critical points [-1.9893:1.9893], so the null hypothesis cannot be ruled out and confirmed with a 95% confidence interval that the mean number of days compared between the 2 treatments presents a statistically significant difference.

Regarding complications, the frequency of delayed union, pseudoarthrosis, misalignment, aesthetic defect, functional loss, and chronic residual pain were evaluated (Table 2).

**TABLE 2** — Frequency of complications

| | Conservative | Surgical | 2v2 | p |
|---|---|---|---|---|
| Consolidation delay | 5 (11%) | 0 | 5,066 | 0,02 |
| Pseudoarthrosis | 3 (7%) | 3 (7%) | 0,003 | 0,95 |
| Misalignment | 2 (4%) | 0 | 1,956 | 0,16 |
| Aesthetic defect | 3 (7%) | 0 | 2,968 | 0,08 |
| Functional loss | 8 (18%) | 4 (9%) | 1,341 | 0,24 |
| Residual pain | 4 (9%) | 3 (7%) | 0,110 | 0,74 |

To assess whether there was a statistically significant difference between the frequency of complications of conservative and surgical treatment, the chi-square test was used. 2 hypotheses were formulated in which the null hypothesis (H0) predicts that there is no significant difference in the frequency of complications from

conservative to surgical treatment. The alternative hypothesis (H1) predicts that there is a difference.

Delayed union occurred in 5 of the 45 patients in the conservative group, while in the surgical group none of the 43 patients developed this complication (p = 0.02). Thus, the null hypothesis can be discarded and confirmed that there is a signific ant difference in the frequency of delayed consolidation in conservative treatment compared to surgical treatment.

Pseudoarthrosis occurred in 3 of the 45 patients, both in the conservative and surgical groups (p = 0.9). In this way, there is no difference between the groups.

Misalignment occurred in 2 of the 45 patients in the conservative group, and none in the surgical group (p = 0.[16]. Thus, it cannot be confirmed that there is a significant difference in the frequency of misalignments in the comparison of treatments.

The aesthetic defect occurred in 3 of the 45 patients, both in the conservative and surgical groups (p = 0.[08]. Thus, it cannot be confirmed that there is a significant difference in the frequency of aesthetic defects between the 2 groups.

Functional loss occurred in 8 of the 45 patients in the conservative group, in the surgical group, in 4 of the 43 patients (p = 0.24).

Residual pain occurred in 4 of the 45 patients in the conservative group, and in the surgical group 3 of the 43 patients (p = 0.74). Thus, it cannot be confirmed that there is a significant difference in residual pain in the comparison of treatments (Table 3).

**TABLE 3** — Frequency of conservative and surgical treatments separated by age

| Age | Conservative (n) | Surgical (N) | p |
|---|---|---|---|
| Elderly (> 60 years old) | 7 | 1 | 0,03 |
| Young people (< 60 years old) | 38 | 42 | |
| Total | 45 | 43 | |

The indication for conservative treatment in the elderly was 7 out of 8 patients. In young patients, conservative treatment was indicated in 38 patients and 42 for surgical treatment (p = 0.03). Thus, it was possible to discard the null hypothesis and confirm that there is a significant difference in the indication of conservative and surgical treatment between the age groups.

## DISCUSSION

Although conservative treatment for clavicle fractures has been used almost exclusively in the past,[2] due to studies showing better results in relation to surgical treatment in the incidence of pseudoarthrosis,[3,4] this view has changed. Some more recent studies indicate better results in surgical treatment for this condition.[5-7] Thus, there is still controversy about the ideal form of treatment.[2] In this context, this study compared surgical and conservative treatment in terms of the presence of consolidation and complications. The main limitation of the medical records was the low quality of the medical records analyzed.

### Complications

#### Pseudarthrosis

It was observed in 3 of the 45 patients in the group that received conservative treatment, while in the group that underwent surgical treatment, 3 of the 43 had it. That said, such a difference is not statistically significant.

#### Consolidation delay

Delayed union affected 11.1% (5 of 45) of the patients in the conservative group, whereas in the surgical group, none of the 43 patients (0%) had this complication. This value is statistically significant. Thus, this study indicated a better result in surgical treatment compared to conservative treatment.

#### Misalignment

Regarding misalignment, it was observed that 2 of the 45 patients in the conservative group were affected. On the other hand, none of the 43 surgical patients presented it. However, this discrepancy was not considered statistically significant.

#### Functional loss

Loss of function was recorded in 8 of the 45 patients treated conservatively, while 4 of the 43 surgical patients had this complication. However, this discrepancy was not statistically significant.

#### Aesthetic defect

The occurrence of aesthetic defects was verified in 3 of the 45 patients in the conservative group, while none of the 43 patients in the surgical group had it, but this difference was not statistically significant.

#### Residual pain

Of the 45 patients treated conservatively, 4 had residual pain, while 3 of the 43 surgical patients were affected by this complication. This difference was not statistically significant.

When stratifying the patients into two groups according to age group, young (18 to 59 years) and elderly (60 years or older), it was observed that 7 of the 8 elderly were submitted to conservative treatment and 42 of the 80 young people received indication for surgical treatment. Such values are considered statistically significant. Thus, it is perceived that conservative treatment is prioritized in the elderly. Not in young people.[8,9]

## CONCLUSION

Conservative and surgical treatment for medial clavicle fractures did not show significant differences in relation to the presence of union and pseudoarthrosis. Furthermore, there was no statistically significant difference in the occurrence of aesthetic defects, misalignment, residual pain and functional loss. On the other hand, there were differences in delayed consolidation, and surgical treatment presented better results. It was also found that conservative treatment was preferred over surgical treatment in the elderly, while in young people the choice was divided.

**Authors' contributions**

*Conceptualization: Caio Eduardo Faidiga de Barros, Cassio Zini*
*Methodology: Leonardo Siana Rocha*
*Writing (original draft): All authors*
*Writing (proofreading and editing): All authors*

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