FUNCTIONAL AND RADIOGRAPHIC OUTCOMES IN PERCUTANEOUS PIN FIXATION OF CLOSED GALEAZZI FRACTURE-DISLOCATION AFTER OPEN REDUCTION INTERNAL FIXATION (ORIF)- PLATING: A COMPARISON BETWEEN EARLY AND LATE SURGERY

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ABSTRACT

BACKGROUND

Galeazzi fracture-dislocation is associated with unstable distal radioulnar joint (DRUJ).

AIM

To compare the functional and radiographic outcomes of patients with Galeazzi fracture dislocation who underwent early and late surgery.

METHODS

This study was a single-center, prospective cohort analytical design involving 65 patients with Galeazzi fracture dislocation who underwent early surgery (≤56 days) (n1=35) and late surgery (>56 days) (n2=30) from 2019 to 2021. Data collected were patients' demographic profiles, radiographic parameters (posterior-anterior [PA] and lateral views), grip strength, and Disabilities of Arm, Shoulder, and Hand (DASH) score. The comparison of the two groups utilized the student t-test for continuous variables and the chi-square or Fisher exact test for categorical variables at a 5% significance level.

RESULTS

No significant difference exists between patients who underwent early surgery and late surgery when compared by demographic profile (sex, age, fracture type, handedness, same handedness-affected side), radiographic parameters (PA and lateral views), and mean grip strength and mean DASH score at 12 months post-operatively.

CONCLUSION

Early and late surgery groups have comparable functional and radiographic outcomes. Undergoing early surgery for closed Galeazzi fracture dislocation has no advantage over late surgery. Therefore, the therapeutic goal should be the anatomic reduction of Galeazzi fracture and DRUJ stabilization.

Keywords

Galeazzi fracture dislocation, Galeazzi fracture, wrist joint, grip strength

INTRODUCTION

Galeazzi fracture-dislocation is a radial diaphysis fracture associated with the disruption of the distal radioulnar joint (DRUJ).[1] Galeazzi fractures account for approximately 7% of all adult forearm fractures, occurring in about one of four radial shaft fractures.[2] Both young men (10:10,000) and older women suffer this injury disproportionately (5:10,000).[2]

Instability of DRUJ is a usual problem. A high threshold of suspicion, early identification, and acute treatment of DRUJ instability can help avoid chronic complications in this complex injury.[3] If these injuries are without treatment, there are long-term consequences, such as functional impairment and chronic discomfort.[4]

The most common Galeazzi fracture-dislocation classification is by Rettig and Raskin wherein these fractures were divided into two based on stability and distance from the mid-articular surface. Type I is within 7.5 cm from the mid-articular surface of the distal radius and known as unstable fractures. Type II is more than 7.5 cm from the mid-articular surface of the distal radius and known as stable fractures.[3]

Physical examination and imaging can assist in the diagnosis of DRUJ instability. A malpositioned or a lax distal ulna may indicate DRUJ instability on physical examination.[5] Likewise, using a conventional roentgenogram can also facilitate the diagnosis.

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Radiographic examination of DRUJ instability involves PA and lateral wrist radiographs. The distal radioulnar space is wider than the contralateral side in the PA view. A radioulnar distance above 6 mm in the lateral view suggests DRUJ instability.[6]

Open reduction internal fixation (ORIF) surgery is essential to treat Galeazzi fracture-dislocation successfully. This approach is due to the fracture's intrinsic instability and deforming forces acting on the shaft of the radius and DRUJ.[7] Conservative management almost invariably produces unsatisfactory results.[8] Radial anatomic restoration and subsequent alignment and stabilization of the DRUJ are the critical therapeutic objectives.[9]

Intraoperative evaluation of the DRUJ is crucial to assess instability and decide whether or not to push ahead with intervention if the DRUJ is unstable.[10] The surgeon can construct a more accurate visual representation of the actual osseous abnormality by recognizing detailed features on conventional radiographs and finding aberrant fluctuation of specific vital parameters.[11]

There was a link between the clinical outcomes and the radiographic observation of fracture reduction. Patients who underwent anatomic fracture reduction had fewer complications and better or equivalent functional outcomes than those who had an inadequate reduction.[12] Donndorff et al.[13] argues that appropriate closed reduction of the ulna after anatomical ORIF of the radius improves the DRUJ's clinical and radiological prognosis in Galeazzi lesions. Inadequate management of Galeazzi fracture can result in disabling consequences, such as persistent DRUJ instability and functional impairment.[1]

Management of the Galeazzi fracture should be managed acutely due to the deformity, pain and disability suffered by the patient and to minimize complications. [8] However due to multiple factors such as the COVID-19 pandemic, patients were not operated acutely. Alajmi et al. [8] emphasized that before attempting to fuse the DRUJ, other treatment options such as closed reduction percutaneous pinning (CRPP) should be exhausted to stabilize the joint.

Recently, the treatment outcome of Galeazzi fracture-dislocation was largely unclear. Internationally published studies rarely include functional and radiographic outcomes, and there is no local research on the subject. There is no current large study that present outcomes of patients after chronic injury that is managed with DRUJ pinning. There is also no conclusive evidence comparing early versus late Galeazzi fracture-dislocation surgery.

Thus, this study aimed to compare the functional and radiographic outcomes of patients with Galeazzi fracture-dislocation who underwent early and late surgery through a single-center prospective cohort design. Specifically, we sought to analyze early and late surgery by demographic profile, radiographic outcomes (posterior-anterior [PA] and lateral views), and functional outcomes (grip strength and Disability of the Arm, Shoulder, and Hand [DASH] score)

MATERIALS AND METHODS

Our institution's review board approved the protocol and granted permission to the research proponents to undertake this research. A prospective cohort analytical design in a single government tertiary hospital was utilized. Researchers employed this method to classify, allocate, and compare the functional and radiographic outcomes of patients undergoing early or late treatment for closed Galeazzi fracture-dislocation immediately after surgery and at three-, six-, and 12 months post-operatively. Data collected were patients' demographic profiles (sex, age, fracture type based on Rattig and Raskin classification, and handedness), radiographic parameters of uninjured and injured extremities (PA and lateral views), grip strength using a dynamometer, and functional outcome using the DASH score.

CASE DEFINITION

The time interval between injury and operation specified the criteria for classifying patients undergoing treatment for closed Galeazzi fracture-dislocation into early surgery (Group 1) and late surgery (Group 2). The present study operationally defined "early surgery" as surgery done within 56 days of injury (≤56 days), whereas "late surgery" as surgery done over 56 days after the injury (>56 days).

STUDY POPULATION

Patients with closed Galeazzi fracture-dislocation who presented to the Emergency Department and Out-Patient Department at the Philippine Orthopedic Center in Quezon City, Philippines, between 2019 and 2021 constituted the study population.

SAMPLE SIZE DETERMINATION

At a 95% confidence level and 0.05 margin of error and considering the average yearly population of patients with Galeazzi fractures admitted and treated with ORIF-Plating, the calculated sample size is 65 (Fig. 1)

STUDY CRITERIA

The study included patients aged 18 to 60 years with isolated closed Galeazzi fracture-dislocation and underwent ORIF-Plating of the radius with CRPP of the DRUJ. The patients agreed to participate in the research and signed the informed consent.

However, the study excluded patients with fractures or dislocations in the same extremity, previous injury or surgery in the same extremity, pre-existing arthrosis of the wrist, cognitive disorders, and unacceptable radiographic parameters of the wrist after CRPP and had an open reduction of the DRUJ.

SURGICAL PROCEDURES

Senior orthopedic surgeons in our institution performed the surgical interventions to prospectively enrolled research subjects. The patient was placed supine under an axillary block during the surgical operation. The surgeon conducted the open reduction and applied a mini–Dynamic Compression Plate (mini-DCP). Subsequently, the surgeon evaluated the reduction and fixation using PA and lateral x-ray views of the injured and uninjured extremities.

The surgeon assessed the reduction and stability of the DRUJ intraoperatively through forearm rotation. The examining doctor's hand grasped the patient's radius, and the other hand's thumb and finger held the patient's ulna and moved in dorsal and palmar direction relative to the radius. Unstable DRUJ was confirmed if there was an increased displacement of the ulnar head close to the contralateral side. If reducible but unstable, CRPP of the DRUJ was done with the forearm in a neutral position. K-wire 1.6mm was parallel with the joint line through the subchondral bone of the distal radius and into the medial cortex of the ulnar head, passing through the four cortices.

The examining doctor re-assessed DRUJ by physical examination. The reduction was ascertained with an x-ray and compared to the contralateral side. The patient was then immobilized using a long-arm posterior mold for six weeks to maintain reduction. K-wire was removed six weeks postoperatively.

Patient rehabilitation was carried out postoperatively according to the protocol developed by Duncan et al.[15] (Table 1)

OUTCOME MEASURES

Functional outcome was the primary outcome. Functional results of patients with Galeazzi fracture-dislocation were measured using the DASH scoring and grip strength 12 months post-operatively. DASH is a 30-item questionnaire and a five-point rating scale with the lowest possible score (0) that means no disability, and the highest possible score (100) that means the most severe disability.[15] Grip strength was assessed using a dynamometer and compared to the contralateral side.

Radiographic outcomes are the secondary outcome. The principal investigator retrieved radiographic images from the Picture Archiving and Communication System (PACS). A radiologist who was not aware of the patients' status and the principal investigator performed measurements immediately after surgery, three-, six-, and 12 months post-operatively. Both PA and lateral views were measured for DRUJ instability. In the PA view, DRUJ instability demonstrates a widening of the distal radioulnar space of more than two millimeters (>2 mm) compared to the contralateral side.[15] On the other hand, DRUJ instability shows a radioulnar dissociation of more than six millimeters (>6 mm) in the lateral view.[6]

STATISTICAL ANALYSIS

Descriptive statistics presented continuous variables, such as mean and standard deviation, while frequency and percentage for categorical variables. In comparing early and late surgery groups, the student t-test was utilized for continuous variables, while the chi-square or Fisher exact test was for categorical data. The level of significance is at 5%. Statistical computations were performed using Medcalc Statistical software.

RESULTS

Between 2019 and 2021, 73 patients with closed Galeazzi fracture-dislocation consulted. Eight patients were ineligible due to additional fracture or dislocation in the same extremity (3 patients) and required an open reduction of the distal radioulnar joint (5 patients). Finally, the study enrolled 65 patients, with 35 classified as undergoing early surgery and 30 classified as late surgery.

Table 2 shows the demographic profile characteristics of patients with Galeazzi fracture-dislocation who underwent early surgery (n=35) and late surgery (n=30). Results revealed no significant difference in the demographic profile characteristics between patients who had early and late surgery in terms of sex, age, Type of Galeazzi fracture, handedness, affected extremity, and same handedness-affected extremity involvement. Both early and late surgery groups were mostly male (100% versus 96.7%) and between 18-30 years old (54.3% versus 60%). Furthermore, Type I fracture was most common in both early and late surgery patients (62.9% versus 46.7%). Right hand was the

most prevalent handedness (77.1% versus 86.7%) and the same side for the injured extremity (57.1% versus 63.3%). In most patients, the affected extremity was also the same handedness (80% versus 76.7%).

In summary, patients who underwent early and late surgery in the current study were primarily male, 18-30 years old, with Type I fracture, right-handed, involvement of right extremity, and same handedness-affected extremity.

Table 3 compares radiographic measurements (PA view) between patients who had early and late surgery. Radiographic measurements of patients who had early and late surgery on PA view were not significantly different when comparing uninjured (unoperated) extremity (0.07 versus 0.00), injured (operated) extremity (5.65 versus 5.62), immediately after surgery (0.37 versus 0.36), three months (0.40 versus 0.33), six months (0.40 versus 0.37), and 12 months post-operatively (0.40 versus 0.44). Also, none of the patients had a non-normal PA range immediately after surgery, three-, six-, and 12 months post-operatively.

Table 4 compares radiographic measurements (lateral view) between patients who had early and late surgery. On the lateral radiographic view, the two groups showed no significant difference. They were comparable in terms of uninjured (unoperated) extremity (0.03 versus 0.00), injured (operated) extremity (13.29 versus 15.23), operated extremity immediately after surgery (0.94 versus 1.31), three months (1.07 versus 1.43), six months (1.15 versus 1.61), and 12 months post-operatively (1.24 versus 1.62). Additionally, none of the patients in the early surgery group had a non-normal LA range immediately after surgery, three-, six-, and 12 months post-operatively. However, 3.3% of late surgery patients showed non-normal LA view measurements six and 12 months post-operatively. Nevertheless, the values were not statistically significant compared to early surgery patients with non-normal results.

Table 5 compares grip strength between patients who underwent early and late surgery, assessed using a dynamometer 12 months post-operatively. The resulting mean grip and p-value of the unoperated extremity were 46.7 for early surgery patients, while 46.31 for late surgery patients (p=0.3266) were not significantly different. On the other hand, the mean grip of the operated extremity was 42.83 for early surgery patients and 42.04 for late surgery patients (p=0.5284), indicating no significant difference. Furthermore, unoperated extremity with non-normal grip strength was 77.1% in early surgery and 80% in late surgery (p=1.0), which has no significant difference. Although almost all operated extremities showed a non-normal range on the final follow-up, no significant difference exists between early and late surgery groups (100% versus 96.7%, p=0.4615).

Table 6 compares the DASH score between patients who had early and late surgery 12 months post-operatively. The resulting mean DASH score was 1.24 for early surgery patients while 2.05 for late surgery patients, but they were not significantly different (p=.1577). Moreover, all patients indicated good functional outcomes in both groups on the last follow-up.

DISCUSSION

This study compared the functional and radiographic outcomes of patients with Galeazzi fracture-dislocation who underwent early surgery and late surgery. Specifically, we analyzed these patients by demographic profile, radiographic results using PA and lateral view measurements, grip strength using a dynamometer, and functional outcome using the DASH scoring.

Research subjects in the current study showed comparable demographic profile characteristics. Generally, patients who underwent early and late surgery for Galeazzi fracture-dislocation were primarily males, between 18-30 years old, with Type I fracture, right-handed, right-side extremity involvement, and same-handedness-affected extremity.

Our findings corroborate previous research involving predominantly male Galeazzi fracture-dislocation patients (n=107 [n=10-40], males 84%).[3,16-19] Similarly, the patients were young adults below 40 years (18-90 years).[3,13,17,18,20-23] Results did not uncover any cases in elderly patients aged 60+. It indicates the infrequent occurrence of this event in seniors.[24] Young adult males seem to have a high fracture incidence. They are regularly involved in high-energy trauma from sports, falls, and vehicle accidents, [2] which explains these results

Studies reported Galeazzi fracture-dislocation reported varying results based on Rettig and Raskin's classification. Both Type I (n=40, 22 [55%])[3] and Type II fractures (n=15, 13 [87%]) [24] were predominant among early surgical cases. Likewise, our findings are consistent with previous research, which found that Galeazzi fracture-dislocation affects dominant extremities in early surgery patients (n=50 [n=10-40], 34 [68%]).[3,17]

With regards to PA radiographic values, our findings showed no significant difference between patients who had early and late surgery in unoperated and operated extremities immediately after surgery, three-, six-, and 12 months after. The study did not observe a non-normal PA range throughout the one-year follow-up. On the lateral view, the early and late surgery groups did not significantly differ in unoperated and operated extremities immediately after surgery, three-, six-, and 12 months after. Throughout the one-year follow-up, the study did not find a non-normal LA range in the

early surgery group. However, a non-normal LA range was present in 3.3% of patients in the late surgery group immediately after surgery, three-, six-, and 12 months after, but not significantly different from the early surgery group.

Our findings support previous research that investigated DRUJ instability.[25] On follow-up, no patient demonstrated DRUJ instability or required additional surgery (average 68 months, range 26-124 months). Two studies revealed DRUJ instability after ORIF (n=161, 47 [29%]).[21,26] Also, Donndorf and colleagues[13] reported good stability with no significant articular disturbances. Patients with intraoperative DRUJ instability showed maintenance of stability post-operatively in 10/12 patients (83.3%).[27] Surprisingly, the early and late surgery groups had comparable postoperative radiographic results throughout the study. These findings could be attributable to ORIF and CRPP's ability to reduce the fracture anatomically and stabilize the DRUJ. It is also possible that the protocol's postoperative patient rehabilitation played a role in similar good results.

With regards to grip strength at 12 months post-operatively, our findings revealed no significant difference between the early and late surgery groups. Almost all patients' operated extremities had non-normal grip strength on final follow-up, but no significant difference exists between the two groups.

The present study's results support the recovery of equivalent strength of a patient with dislocated DRUJ compared to the contralateral uninjured extremity.[22] Contrary to our findings, Johandi and Sechachalam[27] reported a grip strength of at least 50% in 10 (83.3%) compared to the unaffected side among patients (n=12) with gross DRUJ instability intraoperatively. Also, Im et al.[28] found grip strength was only 87.3% compared to the unaffected extremity (n=13) on the final follow-up. Jaysingani et al.[24] found most patients (84.66%) restored their maximum grip strength on the last follow-up. These findings could not demonstrate the recovery of full grip strength.

These findings suggest that Galeazzi fracture-dislocation who had early or late surgery are equally at risk for long-term grip strength deficits. It is difficult to reconcile the non-normal grip strength of patients despite ORIF and CRPP treatment. The interplay of other factors, such as physique, body mass index, handedness, upper arm circumference, and bone mineral density, may explain these results.[29]

Finally, our findings indicated a comparable DASH score at 12 months post-operatively between the early and late surgery groups. All patients achieved an excellent functional recovery on the final follow-up. These results match earlier studies that found remarkable functional recovery among all surgically managed patients, with a mean DASH score of 13 ± 5.0 (n=13). [28] However, contrary to our findings, these studies reported a proportion of patients who did not achieve the ideal functional results on the last follow-up (n=57, 15 [26%])[16,30] The appropriateness of ORIF and CRPP for treating Galeazzi fracture-dislocation may explain the observed improvement in functional results in early and late surgery groups. It could also be due to uncomplicated, stable, and reducible cases.

There are certain drawbacks to the current study's methodology. It's important to remember that the present study's sample size is modest and may not accurately reflect the population of Galeazzi fracture-dislocation patients. Due to the short study period, the number of prospective cases for surgical management may have been limited. Therefore, the authors urge care in interpreting the findings of this study.

CONCLUSION

This study aimed to compare the functional and radiographic outcomes of patients with Galeazzi fracture-dislocation who underwent early and late surgery in a single tertiary government hospital. Patients with Galeazzi fracture-dislocation who had early or late surgery had similar demographic profiles, radiographic outcomes (PA and lateral views), and functional outcomes (grip strength and DASH score). Given these findings, it seems possible that early surgery has no advantage over late surgery in terms of functional and radiographic outcomes. Therefore, the therapeutic goal for a Galeazzi fracture-dislocation should be anatomic reduction and stabilization of the DRUJ. The non-normal grip strength of nearly all patients in the early and late surgery groups on final follow-up at 12 months post-operatively is a vital issue that emerged from the findings. However, these findings are not particularly reassuring in the case of uncomplicated fractures that are generally stable and reducible. A postoperative rehabilitation program may be beneficial.

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FIGURES AND TABLES

Table 1. REHABILITATION PROTOCOL OF RADIUS FRACTURE AFTER ORIF-PLATING [9]

0-4 weeks	4-6 weeks	6-8 weeks	8-10 weeks	10-12 Weeks	12 Weeks
• Long arm cast is applied. • Active and passive range of motion exercises are initiated to the digits, elbow, and shoulder, as needed. Once patient is put in a short arm cast, forearm rotation may begin. • Begin intrinsic muscle strengthening and tendon gliding exercises to the hand/digits. • Edema control is applied to the digits as needed. ° Note: Monitor for increased levels of edema and pain which may result in dystrophy.	• Cast is removed when sufficient healing is present. • Wrist immobilization splint is applied to wear between exercises and at night. • Passive and Active Assist ROM exercises are initiated to the wrist and forearm 8 times a day. • FES for thumb, digits, wrist, and forearm. • Edema control as needed	• Begin Active ROM. • Dynamic splinting wrist and/or forearm 4–6 times a day. • Patient may begin light ADLs with splint on.	• Patient may begin ADLs without splint. • Grip strengthening with putty and/or hand helper is initiated.	• Wrist strengthening is initiated. • Light normal use is resumed.	• Full normal use is resumed.

Table 2. COMPARISON OF DEMOGRAPHIC PROFILE

	Early Surgery (n=35)	Late Surgery (n=30)	p value
Sex, n, %			
Male	35 (100)	29 (96.7)	0.4615 ns
Female	0 (0.0)	1 (3.3)	
Age, n, %			
18 to 30	19 (54.3)	18 (60.0)	0.7143 ns
31 to 40	11 (31.4)	10 (33.3)	
41 to 60	5 (14.3)	2 (6.7)	
Type of Galeazzi Fracture, n, %			
Type I	22 (62.9)	14 (46.7)	0.2189 ns
Type II	13 (37.1)	16 (53.3)	
Handedness, n, %			
Left	8 (22.9)	4 (13.3)	0.3587 ns
Right	27 (77.1)	26 (86.7)	
Affected extremity, n, %			
Left	15 (42.9)	11 (36.7)	0.6143 ns
Right	20 (57.1)	19 (63.3)	
Handedness and Affected extremity			
Same Handedness and extremity	28 (80)	23 (76.7)	0.7709 ns
Different Handedness and Extremity	**7 (20)**	**7 (23.3)**	

Table 3. COMPARISON OF POSTERIOR-ANTERIOR (PA) VIEW RADIOGRAPHIC MEASUREMENTS

	Early Surgery (n=35)	Late Surgery (n=30)	p value
Unoperated			
Postero -anterior view (mm), mean ± sd	0.07 ± 0.35	0.0 ± 0.0	0.2631 ns
PM (Non normal), n, %	0 (0.0)	0 (0.0)	-
Operated Injury			
Postero -anterior view (mm), mean ± sd	5.65 ± 2.18	5.62 ± 2.22	0.9648 ns
PM (Non normal), n, %	35 (100)	28 (96.6)	0.4531 ns
Operated Injury - Immediate Post-op			
Postero -anterior view (mm), mean ± sd	0.37 ± 0.52	0.36 ± 55	0.915 ns
PM (Non normal), n, %	0 (0.0)	0 (0.0)	-
Operated Injury - 3 Months			
Postero -anterior view (mm), mean ± sd	0.40 ± 0.53	0.33 ± 0.55	0.6061 ns
PM (Non normal), n, %	0 (0.0)	0 (0.0)	-
Operated Injury - 6 Months			
Postero -anterior view (mm), mean ± sd	0.40 ± 0.53	0.37 ± 0.56	0.7908 ns
PM (Non normal), n, %	0 (0.0)	0 (0.0)	-
Operated Injury - 1 year			
Postero -anterior view (mm), mean ± sd	0.40 ± 0.53	0.44 ± 0.62	0.7704 ns
PM (Non normal), n, %	0 (0.0)	0 (0.0)	-

significant, ns not significant

Table 4. COMPARISON OF LATERAL VIEW RADIOGRAPHIC MEASUREMENTS

	Early Surgery (n=35)	Late Surgery (n=30)	p value
Unoperated			
Lateral View (mm), mean ± sd	0.03 ± 0.17	0.0 ± 0.0	0.3586 ns
LA (Non normal), n, %	0 (0.0)	0 (0.0)	-
Operated Injury			
Lateral View (mm), mean ± sd	13.29 ± 8.35	15.23 ± 8.05	0.3506 ns
LA (Non normal), n, %	27 (77.1)	23 (79.3)	1.0000 ns
Operated Injury - Immediate Post-op			
Lateral View (mm), mean ± sd	0.94 ± 1.36	1.31 ± 1.39	0.2775 ns
LA (Non normal), n, %	0 (0.0)	0 (0.0)	-
Operated Injury - 3 Months			
Lateral View (mm), mean ± sd	1.07 ± 1.50	1.43 ± 1.52	0.3477 ns
LA (Non normal), n, %	0 (0.0)	0 (0.0)	-
Operated Injury - 6 Months			
Lateral View (mm), mean ± sd	1.15 ± 1.55	1.61 ± 2.19	0.3274 ns
LA (Non normal), n, %	0 (0.0)	1 (3.3)	0.4615 ns
Operated Injury - 1 year			
Lateral View (mm), mean ± sd	1.24 ± 1.55	1.62 ± 2.16	0.4127 ns
LA (Non normal), n, %	0 (0.0)	1 (3.3)	0.4615 ns

significant, ns not significant

Table 5. COMPARISON OF GRIP STRENGTH ON FINAL FOLLOW-UP (12 MONTHS AFTER SURGERY)

	Early Surgery (n=35)	Late Surgery (n=30)	p value
Unoperated (kg), mean ± sd	46.87 ± 0.49	46.31 ± 3.29	0.3266 ns
Operated (Kg), mean ± sd	42.83 ± 3.45	42.04 ± 6.37	0.5284 ns
Unoperated (Non normal), n, %	27 (77.1)	24 (80.0)	1.0000 ns
Operated (Kg) (Non normal), n, %	35 (100)	29 (96.7)	0.4615 ns

significant, ns not significant

Table 6. COMPARISON OF DASH SCORE ON FINAL FOLLOW-UP (12 MONTHS AFTER SURGERY)

	Early Surgery (n=35)	Late Surgery (n=30)	p value
DASH Score	1.24 ± 2.08	2.05 ± 2.49	0.1577 ns
DASH interpretation, n, %			
0 to 25 Good	35 (100	30 (100)	-
26 to 29 Fair	0 (0.0)	0 (0.0)	
50 to 75 Poor	0 (0.0)	0 (0.0)	
76 to 100	0 (0.0)	0 (0.0)	

significant, ns not significant

$$n = \frac{z^2 p \times (1-p)}{d^2} = \frac{1.96^2 \times 0.50 \times (1-0.50)}{0.05^2} = 384$$

$$Final = \frac{384}{1 + \frac{384-1}{78}} = 65$$

Fig. 1. SAMPLE SIZE DETERMINATION

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