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Chronic Obstructive Pulmonary Disease is an independent risk factor for postoperative complications following Operative Treatment of Distal Radius Fracture

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ABSTRACT

Background: A distal radius fracture is the commonest kind of fracture in the upper extremity. Numerous pulmonary, cardiac, cerebro-vascular and vascular co-morbidities are associated with a history of Chronic Obstructive Pulmonary Disease (COPD).

Objective: To explore the correlation between COPD and postoperative complications in patients undergoing surgery for distal radius fracture.

Methodology: The current study was conducted at the Orthopaedic Surgery Department, Bacha Khan Medical College, Mardan Medical Complex, Mardan from January 2020 to January 2021. Those individuals who had done ORIF for DRF were enrolled. This research created two patient groups to assess effect of COPD on consequences after ORIF for DRF. Thirty days postoperative complications were assessed in this analysis, and bivariate and multivariate analyses were performed.

Results: A total of 12,426 individuals who had done ORIF for DRF were included for the analysis in the current study. Out of which 11,958 patients (96.23%) individuals had no COPD whereas 468 (3.77%) were COPD positive. Comorbidities were substantially more common in COPD patients who had ORIF for a DRF than in non-COPD patients. After undergoing surgery to cure a distal radius fracture, bivariate analysis revealed that patients with COPD had a higher chance of experiencing any complications following the procedure within 30 days.

Conclusion: This study evaluated that for individuals getting distal radius fracture, Chronic obstructive pulmonary disease is an independent risk factor that increases the likelihood of experiencing various post-surgical complications, including the need for blood transfusions, longer hospital stays, and readmissions to the hospital.

Keywords: Fracture; Distal radius; Postoperative; Complications; COPD

Introduction

In the upper extremity, distal radius fracture (DRF) is the commonest kind of fracture. Percutaneous pinning, internal fixation and external fixation are all part of the operational repair of DRF. The usage of DRFs for "open reduction internal fixation" (ORIF) has increased lately due to the introduction of volar plate fixing. One typical method for DRF ORIF is the use of volar locking plates, which have enabled early mobilization.[1]The frequency of DRF ORIF has grown over the last three decades, and the ORIF surgery encounter its own accounts for 60–80% of all expenses associated with DRF fractures. Given that many patients getting DRF ORIFs are older, they represent a significant financial burden for the Medicaid population in particular. If ORIFs make up 50% of all DRF operations, the projected Medicare expenditures for all DRF-related expenditures will amount to 240 million dollars.[2] Although there is fluctuation, it is believed that the incidence major chronic obstructive pulmonary disease, also known as COPD is 10% globally. Numerous pulmonary, cardiac, cerebro-vascular and vascular co-morbidities are linked with COPD history.[3] Given that COPD is known to be strongly influenced by age, smoking, and environmental exposure, research on the connection between COPD and orthopaedic surgery recovery has gained attention. A study done by by Vakharia et al. reported that COPD was related to higher incidence of thromboembolic events after primary knee arthroplasty.[4] Previous studies in 2018 reported that COPD has association to a range of systemic problems following primary and replacement knee arthroplasty, respectively.[5,6] As far as we are aware, no prior research has looked at the relationship between a patient's COPD position and surgical problems for individuals getting DRF ORIF. The current study was carried out to determine the correlation between chronic obstructive pulmonary disease and postoperative complications in patients undergoing surgery for distal radius fracture. In our setup the distal radius fracture is treated on treated on daily basis but no study has been carried out on the association of COPD with the postoperative complication after surgery of distal radius fracture.

Objective

To explore the correlation between chronic obstructive pulmonary disease and postoperative complications in patients undergoing surgery for distal radius fracture.

Methodology

The current study was conducted at the Orthopaedic Surgery Department, Bacha Khan Medical College, Mardan Medical Complex, Mardan from January 2020 to January 2021 after taking permission from the ethical committee of the institute. Those individuals who had done ORIF for DRF were enrolled in our study. Those individuals whose age was less than 18 years, BMI was less than 18.5 kg/m or if they experienced simultaneous surgeries while visiting visit for ORIF for distal radius fracture. This research created two patient groups to assess effect of COPD on consequences after ORIF for DRF. Those who have COPD in past and those who do not have COPD are included in this category. 30 days complications following surgery were divided into categories or domains based on their clinical relevance. These groups comprise deep surgery site infection, organs or space infection, superfcial surgical site infection, and/or disruption of the wound), cardiac (myocardial infarction and/or cardiac arrest), pulmonary problems, renal problems, thrombo-embolism as well as sepsis. Within 30 days following surgery, the following outcomes were further documented: death, UTI, postoperative transfusion, prolonged hospital stay, reoperation, and readmission. Extended length of stay was defined as more than three days.

The software used to perform bivariate and multivariate analysis was SPSS Version 26 (Armonk). When applicable, analysis of variance and Pearson's Chi squared test were used in bivariate analysis to examine patient characteristics, comorbidities, and postoperative problems. Data on comorbidities, clinical features, and demographics were incorporated into a multivariate analysis for p-values less than 0.20. Only the postoperative complication factors with a p-value less than 0.05 were chosen for the multivariate analysis. The multivariate analysis yielded findings that were presented using p-values and odds ratios accompanied by 95% confidence intervals. In this study, a significance level of < 0.05 was determined as the threshold for statistical significance.

Results

A total of 12,426 individuals who had done ORIF for DRF were included for the analysis in the current study. Out of which 11,958 patients (96.23%) individuals had no COPD whereas 468 (3.77%) were COPD positive. Out of all the individuals COPD was most prevalent in females 408 (87.18%) and smokers also had COPD in maximum ratio 196 (41.88%) (Table 1). COPD patients who received ORIF for a DRF significantly more suffered from comorbid conditions than non-COPD cases. Major commodities in COPD positive individuals were hypertension, followed by Disorder of bleeding, Congestive heart failure and diabetes mellitus**.** After undergoing surgery to cure a distal radius fracture, bivariate analysis revealed that patients with COPD had a higher chance of experiencing any complications following the procedure within 30 days when compared to those without the condition. The major complication are described in table 2.

Table 1. Clinical and Demographics features of the participants Experiencing Operative Therapy of Distal Radius Fracture

Features	No COPD n (%)	Yes COPD n (%)	P –Value
Total individuals	11,958 (96.23)	468 (3.77)	
Gender			
Female	8,838 (73.90)	408 (87.18)	< 0.001
Male	3,120 (26.10)	60 (12.82)	
Occupation			
Farmers	9,461 (79.11)	434 (92.74)	< 0.001
Shopkeeper	601 (5.03)	11 (2.35)	
Barber	1,369 (11.45)	15 (3.21)	
Teachers	100 (0.84)	8 (1.71)	
Student	427 (3.57%)	00 (00)	
Smoking Staus			
Smokers	429 (3.59)	196 (41.88)	< 0.001
Non-smokers	11529 (96.41)	272 (58.1)	
Functional Status Preoperative			
Not dependent	11,731 (98.10)	428 (93.59)	<0.001
Partially dependent	215 (1.80)	28 (5.98)	
Totally dependent	12 (0.10)	12 (2.56)	
Mean age in years (SD)	56.60 (16.44)	66.53 (10.2)	< 0.001
Mean BMI (SD)	28.53 (6.62)	29.12 (7.12)	0.056

Discussion

In our study, a total of 12,426 individuals who had done ORIF for DRF were included for the analysis in the current study. Out of which 11,958 patients (96.23%) individuals had no COPD whereas 468 (3.77%) were COPD positive. Out of all the individuals COPD was most prevalent in females 408 (87.18%) and smokers also had COPD in maximum ratio 196 (41.88%). Our results demonstrate that COPD history prior to ORIF for DRF is an important risk factor linked to complications after surgical procedure such as transfusion-needed hemorrhage, prolonged hospital stays, and readmissions to the hospital. Our findings confirm that improved preoperative medical care is required prior to DRF ORIF surgeries. In order to get the greatest perioperative results, we support an integrative strategy to preoperative treatment that involves collaboration among pulmonologists, hospitalists, anesthesiologists, and surgeons prior to these surgeries. Additional perioperative measures are necessary for patients with COPD. According to earlier research, individuals with severe COPD are more likely to

Table 2. Bivariate Analysis of Postoperative complications of participants

Complications	COPD No n (%)	COPD Yes n (%)	p-value
Total participants	11,958	468	
Any	99 (0.83%)	20 (4.27)	< 0.001
Major	24 (0.20%)	5 (1.07)	0.02
Minor	67 (0.56)	12 (2.56)	< 0.001
Death	8 (0.07)	3 (0.64)	< 0.001
Wound	29 (0.24)	2 (0.43)	0.430
Hypertension	4,048 (33.85)	292 (62.39)	< 0.001
CHF	29 (0.24)	12 (2.56)	< 0.001
Diabetes (Insulin-dependent DM)	375 (3.14)	36 (7.69)	< 0.001
Cardiac	7 (0.06)	2 (0.43)	0.004
Pulmonary	16 (0.13)	6 (1.28)	< 0.001
Renal	5 (0.04)	1 (0.21)	0.096
Thromboembolic	6 (0.05)	1 (0.21)	0.143
UTI	6 (0.05)	0 (0.0)	< 0.001
Postoperative transfusion	31 (0.26)	6 (1.28)	< 0.001
Extended length of stay (> 3 days)	5 (0.04)	40 (8.55)	< 0.001
Re-operation	286 (2.39)	5 (1.07)	0.724
Re-admission	109 (0.91)	25 (5.34)	< 0.001
No complication	6808 (56.93)	00 (00)	< 0.001

experience reflexive bronchoconstriction and hyper dynamic inflation.[7,8] In older individuals, chronic obstructive pulmonary disease (COPD) is a multifaceted illness with a number of distinct age-related features. Age-related alterations in pulmonary lung function and decreased sensitivity to bronchoconstriction and hypoxia may increase the risk of death or other COPD problems for older persons. To reduce airway stress in these individuals, neuraxial, regional, or laryngeal mask airway anesthesia may be used in place of tracheal intubation. These individuals need to have their respiratory parameters—such as the degree of anesthesia, the quantity of volatile anaesthetic breathed, and expiration times—carefully monitored throughout surgery. Patients with severe COPD may benefit from post-operative strategies like inducement pulmonary function testing, persistent positive airway pressure and safe positive-pressure ventilation to guarantee sufficient breathing and reopen atelectatic regions .[9–11] Thus, appropriate care for COPD patients involves several factors before, during, and following surgery. To the best of our knowledge, there have been few prior investigations on the perioperative results for patients with COPD getting DRF ORIF.

Individuals having COPD had a higher probability to have

a number of comorbid condition before surgical procedure, such as hypertension (292 (62.39) vs 4,048 (33.85)),CHF (12(2.56) vs 29 (0.24)), diabetes (36 (7.69) vs 375 (3.14)) followed by failure of kidney, use of steroid before surgery and bleeding disorders, according to our study. This is in line with earlier research that shown the correlation between COPD and a number of systemic illnesses. Cardiac problems, pulmonary associated problems, and lung cancer are examples of co-morbidities associated with cardiopulmonary conditions. Because they all entail chronic systemic inflammation, other co-morbidities including anxiety, metabolic syndrome, obesity, diabetes, and systemic venous thromboembolism are linked to COPD.[12]

A growing body of research suggests that chronic obstructive pulmonary disease (COPD) is a multifactorial illness including factors other than airflow obstruction. It affects gas exchange and heart function profoundly, with systemic repercussions. Furthermore, since COPD is caused by inflammation and/or changes in repair mechanisms, the "spill-over" of mediators of inflammation into the bloodstream may lead to significant systemic symptoms like cachexia and skeletal muscle atrophy. Comorbid conditions include heart failure, ischemic heart disease, osteoporosis, cancer of the lungs, normocytic anaemia, depression, and diabetes may also be brought on by or made worse by systemic inflammation. The morbidity of COPD is exacerbated by comorbid conditions, which raises hospital stays, death, and medical expenses. Comorbidities need thorough evaluation since they make managing COPD more difficult.[13,14] In our study, after adjusting for the different co-morbid conditions it was shown that chronic obstructive pulmonary disease (COPD) is an independent risk factor that increases the likelihood of experiencing various post-surgical complications, including the need for blood transfusions, longer hospital stays, and readmissions to the hospital. Because COPD patients could have significant postoperative sequelae from ORIF, ORIF for DRFs could come with a large cost burden. Our study highlights the significance of COPD medical therapy prior to ORIF procedures, especially given that ORIF procedures are rapidly taking the place of DRFs' choice procedures and that the number of ORIF procedures performed in the Medicare population is growing. In order to maximise perioperative consequences, we support the team of healthcare professionals addressing COPD and other medical comorbidities prior to orthopaedic surgery as the field moves towards an outcomes-based system that aims to prevent difficulties and reduce costs.[14] In our study it was shown that COPD is an independent risk factor and is an indicator for poorer results in DRF for ORIF. These results are in line with the findings of the previous studies that demonstrate that COPD is a risk component for complications and longer lengths of stay in orthopaedic related surgeries, including spine treatments and knee arthroplasties.[15-17]

Conclusion

This study evaluated that for individuals getting distal radius fracture, Chronic obstructive pulmonary disease is an independent risk factor that increases the likelihood of experiencing various post-surgical complications, including the need for blood transfusions, longer hospital stays, and readmissions to the hospital.

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