Original Article

Comparison of Outcomes for Distal Upper Extremity Amputations Between Plastic Surgeons and Orthopedic Surgeons: A Retrospective Study

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Conflict of interest: None
Funding source: None

Article received: 24-12-23
Article accepted: 18-05-24

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ABSTRACT

Objective: To compare the outcomes of patients undergoing distal upper extremity amputations within 30 days of surgery.

Methodology: We conducted a retrospective study using data from the hospital's HIMS database, covering the years Oct 2018 to Oct 2023. Approval from the institutional review committee was obtained before the commencement of the study. We included patients who underwent surgery for an upper extremity amputation by either an orthopedic or plastic surgeon. Specific surgery numbers were used to identify the type of amputation: forearm, wrist and finger. Surgeries to revise a previous amputation were excluded from this study.

Results: Out of 680 patients included in the study, 58.08% (n=395) had surgery by orthopedic surgeons and rest of the 41.92 (n=285) by plastic surgeons. In both the groups, most surgeries were for finger amputations. Interestingly, there wasn't a significant difference in the types of surgeries performed by orthopedic surgeons compared to plastic surgeons. On average, plastic surgery procedures took slightly longer than those performed by orthopedic surgeons (52 minutes vs. 38 minutes). This difference was statistically significant, but the actual difference in time (around 5 minutes) is unlikely to have a major impact on patient outcomes.

There were no significant differences between the two surgeon groups in terms of the urgency of the surgeries (emergency vs. planned), whether patients stayed overnight in the hospital, or the condition of the wounds after surgery.

Conclusion: Plastic surgeons and orthopedic surgeons achieved similar results in terms of complications within the first 30 days after surgery (perioperative complications) for patients undergoing hand, wrist, or finger amputations (distal upper extremity amputations). This suggests that both specialties can provide equally high-quality care for these procedures.

Keywords: amputations, Hand fellowship training, Outcomes, Orthopedics, Plastics.

Introduction

Surgical problems are a major contributor to the world's overall illness burden, accounting for between 28 and 32 percent.[1,2] Despite this significant burden, nearly 5 billion people lack access to safe and affordable surgery when they need it. Projections indicate that surgical conditions could lead to a potential loss of $20.7 trillion in GDP between 2015 and 2030, with the most severe impact being felt in low- and middle-income countries (LMICs).[3] Around the world, especially in low- and middle-income countries, there's a rising urgency to address the negative social and economic impacts of poor surgical care.

Pakistan, a large, low- and middle-income country (LMIC) with a predominantly rural population of nearly 220 million, faces a growing challenge in ensuring surgical care access for a significant portion of its citizens. This challenge is further compounded by the fact that nearly 30% of the population lives below the poverty line.[4] Pakistan boasts a large public health network with over 100,000 community health workers, nearly 10,000 primary care facilities, and hundreds of hospitals across all regions. Notably, over 80% of the country's hospital beds are in the public sector.[5] However, challenges remain. Uneven quality of care and underutilization of primary and secondary care facilities are major concerns. In fact, recent surveys show that most people (>75%) use private healthcare providers first[6]. This highlights the need to address quality and accessibility within the public system.

Authors Contribution: [1]Substantial contributions to the conception or design of the work; or the acquisition, Final approval of the version to be published [2]Drafting the work or revising it critically for important intellectual content, [3]Active participation in active methodology .

Many hospitals in our Pakistani setup struggle to offer timely care from specialized surgeons for urgent and emergency upper extremity surgeries due to a lack of available specialists. Call coverage for hand injuries remains a critical issue. Wrist, hand, and finger injuries are very common in emergency departments.[7,9] Therefore, factors like location (urban vs. rural) and socioeconomic status that limit access to care highlight the crucial role of hand surgeons in emergency surgical services. To address call coverage gaps, hospitals often rely on both plastic and orthopedic surgeons, whose training backgrounds differ, to manage hand and upper extremity treatments.

Hand surgery requires a broad skillset, encompassing fixing fractures, managing wounds, performing delicate microsurgery for reattached limbs and tissue flaps, and using arthroscopy for minimally invasive procedures.[10,11] There's a notable difference in the surgical experience of residents and fellows training to be hand surgeons. Training programs themselves also vary. Orthopedic hand fellowships focus on bone, joint surgery, arthroscopy, and even include shoulder and elbow procedures. In contrast, plastic surgery hand fellowships emphasize microsurgery, soft tissue repair, fixing hand fractures, and wound coverage. It's important to note that some orthopedic programs also cover microsurgery and large reconstructive procedures. Recognizing the wide range of cases in hand surgery, there's a growing trend of training programs that combine elements from both orthopedic and plastic surgery disciplines.

Rising healthcare costs have pushed the government to find ways to improve patient outcomes while reducing expenses. Studies show that the number of surgeries a doctor performs can influence their success rate across various specialties. Additionally, a surgeon's training background can affect outcomes for specific procedures, such as who performs better on abdominal aortic aneurysms: vascular surgeons or general surgeons. This research gap also applies to hand surgery in Pakistan.

This study aimed to compare the outcomes of patients undergoing distal upper extremity amputations within 30 days of surgery. We used the HIMS (Hospital information management system) database of our hospital to analyze the results of surgeries performed by orthopedic and plastic surgeons.

Methodology

We conducted a retrospective study using data from the hospital's HIMS database, covering the years 2018 to 2023. Approval from the institutional review committee was obtained before the commencement of the study. This database is a rich resource, collecting information on different factors for surgery patients. Dedicated staff at the hospital gather the information and undergo rigorous training to ensure data accuracy.

We included patients who underwent surgery for an upper extremity amputation by either an orthopedic or plastic surgeon. Specific surgery numbers were used to identify the type of amputation: forearm, wrist and finger. Surgeries to revise a previous amputation were excluded from this study.

We looked at two main factors that might influence outcomes: the type of surgeon (orthopedic or plastic) and various patient characteristics. Unfortunately, the database didn't have information on whether the surgeon had special training in hand surgery, so we couldn't include that in our analysis.

For the patient characteristics, we considered factors related to the surgery itself (operative time, emergency surgery, hospital stay, wound condition), along with general patient details (age, gender, ethnicity). We also looked at various health conditions the patients might have, such as weight (BMI), overall health score (ASA score), diabetes, high blood pressure needing medication, smoking history, heart problems, lung issues, kidney problems, bleeding risks, and chronic steroid use.

We investigated two main types of outcomes in this study:

Major complications: These included death or needing another surgery within 30 days of the first procedure.

Other complications: We also looked at various other issues that could happen after surgery, including needing a blood transfusion, blood clots, infections (including surgical site infections), breathing problems, kidney problems, nerve damage, and heart problems. Data was entered into IBM SPSS version 24. We analyzed the data in two main ways:

For continuous data (like age), we summarized the information by showing average values and how spread out the data was (standard deviation).

For categorical data (like yes/no answers), we used appropriate statistical tests to compare the two groups (orthopedic vs. plastic surgeons). A p value less than 0.05 was considered as significant. Since we looked at many different outcomes, we adjusted how we determine what results are statistically significant. This helps us avoid making mistakes due to considering too many comparisons.

Results

Out of 680 patients included in the study, 58.08% (n=395) had surgery by orthopedic surgeons and rest of the 41.92 (n=285) by plastic surgeons. In both the groups, most surgeries were for finger amputations. Interestingly, there wasn't a significant difference in the types of surgeries performed by orthopedic surgeons compared to plastic surgeons. The results are displayed in the table I.

On average, plastic surgery procedures took slightly longer than those performed by orthopedic surgeons (52 minutes vs. 38 minutes). This difference was statistically significant, but the actual difference in time (around 5 minutes) is unlikely to have a major impact on patient outcomes.

There were no significant differences between the two surgeon groups in terms of the urgency of the surgeries (emergency vs. planned), whether patients stayed overnight in the hospital, or the condition of the wounds after surgery. Details about the surgeries are provided in figure 1.

Tables II shows details about patient demographics and health conditions for each surgeon group. Age, gender, and body mass index (BMI) were similar between the two groups. However, there were significant differences in ethnicity (p-value < 0.001) and some health conditions between patients treated by orthopedic surgeons and plastic surgeons.

Amputations were most commonly caused by trauma, gangrene, and osteomyelitis. Interestingly, orthopedic and plastic surgeons treated similar numbers of patients for these conditions, except for gangrene linked to type 2 diabetes. In that case, orthopedic surgeons treated a significantly higher proportion of patients (4.0% vs. 0%, p-value < 0.001). The results are shown in figure 2.

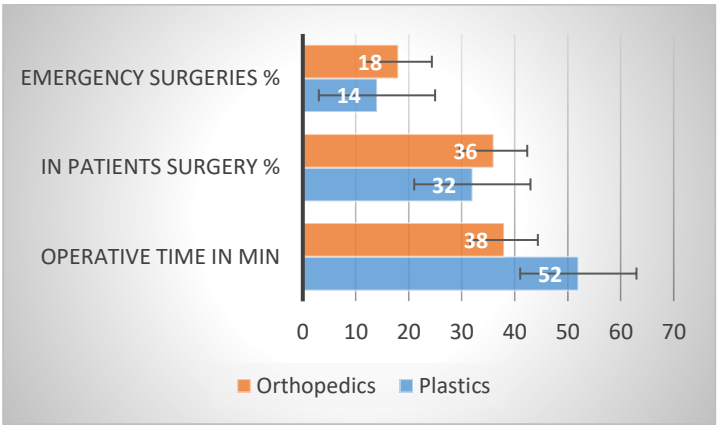

Figure 1. Operative Details specialty wise.

Table II: Demographics details of the study participant's specialty wise.

Characteristics		Plastics (n=285)	Orthopedics (n=395)	*P* value
Age in years (Mean +/- SD)		51.2	52.8	0.090
40-50		182 (64.0%)	268 (67.8%)	0.114
51-60		57 (20.0%)	72 (18.2%)	
61-70		46 (16.0%)	55 (13.9%)	
Sex	Male	222 (77.9%)	312 (78.9%)	0.007
	Female	63 (22.1%)	83 (21.0%)	
Ethnicity	Punjab	188 (66.0%)	290 (73.5%)	<0.001
	KP	64 (22.5%)	76 (19.2%)	
	Sindh	0	0	
	Baluchistan	0	0	
	AJK	33 (11.5)	29 (7.3%)	
BMI	18.5-24	67 (23.5%)	89 (22.5%)	0.212
	25-29	86 (30.2%)	121 (30.6%)	
	30-34	63 (22.1%)	101 (25.6%)	
	35-39	69 (24.2%)	84 (21.3%)	
Co-morbidities	HTN	78 (27.4%)	112 (28.4%)	0.112
	DM	125 (44.0%)	182 (46.0%)	0.242
	CVD	44 (15.4%)	63 (15.9%)	0.321
	Renal disease	20 (7.0%)	16 (4.1%)	0.004
	Pulmonary disease	18 (6.3%)	22 (4.6%)	0.008

Even though patients treated by each specialty differed in terms of surgery details, background factors, and existing health conditions, there were no major differences in how well they fared according to the key measures we looked at, both initially and in the long term. The results are shown in table III.

Table I: Specialty wise procedures details.

Organs involved	Details	Plastic Surgeries (n=285)	Ortho Surgeries (n=395)	*P* value
Finger	Amputation of either finger of thumb	251(88.07%)	344(87.08%)	0.868
Fore arm	Amputation through ulna/radius	18 (6.31%)	26 (6.58%)	0.662
Palm/wrist	Transmetacarpal amputation/Disarticulation through wrist	16 (5.62%)	25 (6.33%)	0.114

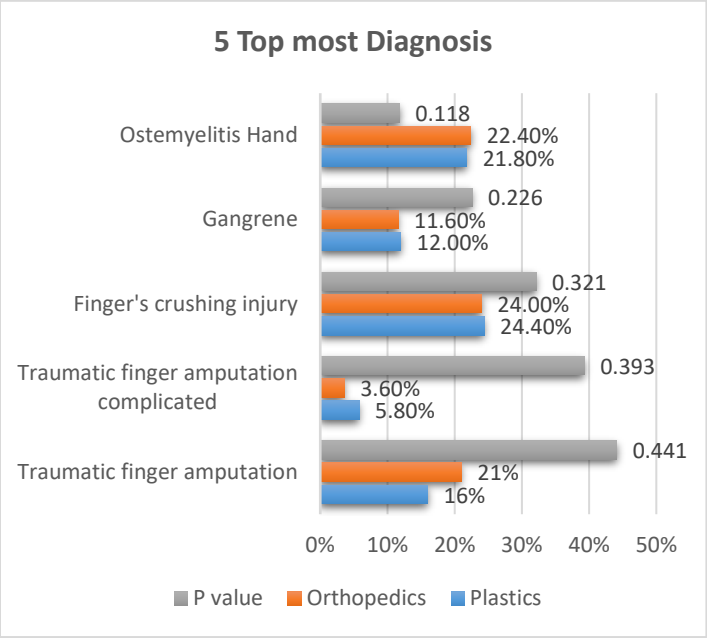

Figure 2. Top 5 most diagnosis by the working surgeons.

Discussion

The 21st century has seen a surge in focus on global health, recognizing health and disease as complex issues influenced by social, economic, political, and environmental factors, not just biology.[14] However, global health efforts have largely centered on specific diseases like HIV/AIDS, tuberculosis, and malaria, along with vaccination programs. This focus has come at the expense of building strong, integrated healthcare systems. In low- and middle-income countries (LMICs) particularly, surgical care has been neglected. Yet, surgery plays a vital role in treating a wide range of illnesses, both existing and emerging. It's also essential for a well-functioning, adaptable, and robust healthcare system.[1]

Hospitals rely on hand surgeons, either orthopedic or plastic, to treat urgent hand injuries and conditions. Rising costs push for minimizing complications after surgery. Concerns exist about potential differences in patient outcomes depending on the surgeon's specialty due to variations in their training.[15,18] Our study looked at numerous different complications that can happen within 30 days of surgery for amputations of the hand, arm, or fingers. We found no significant difference in these complications between patients treated by orthopedic surgeons and those treated by plastic surgeons. This suggests that surgeons from both specialties can provide equally good quality care for these procedures.

Serious hand, arm, and finger injuries (upper extremity amputations) often require immediate surgery by specially trained hand surgeons at well-equipped hospitals.[19,22] Our study found that orthopedic surgeons perform more of these amputations than plastic surgeons (58% vs 42%). This likely reflects the higher number of orthopedic hand surgeons compared to plastic hand surgeons nationwide. There's also a trend of fewer plastic surgeons going into hand surgery. This might be due to factors like lower pay for microsurgery and a heavier workload. Plastic surgery training in hand surgery seems to be focusing more on microsurgery and wound repair, while orthopedic hand surgeons handle more bone and joint procedures.

Where and why amputations happened weren't major factors in this study. Most hand and finger amputations, for both plastic and orthopedic surgeons, involved single fingers or rays. Amputations were mainly due to trauma or infection. Interestingly, we found a small but statistically significant difference in surgery times - orthopedic surgeons took slightly less time on average. This difference wasn't big enough to affect patient outcomes.[23]

Previous research suggests orthopedic and plastic surgeons might have different approaches to hand surgery, which could explain the time difference seen here. Future studies where these specialists collaborate could help identify the best practices to improve hand surgery care overall.[24]

Table III: Incidence of primary and secondary outcomes among the study participants.

Characteristics		Plastics	Orthopedics	P value
Primary Outcomes	Mortality	1 (0.3%)	0	0.004
	Repeated surgeries	14 (4.9%)	9 (2.3%)	0.114
Secondary Outcomes	DVT	6 (2.1%)	0 (0%)	0.012
	Stroke	0 (0%)	0 (0%)	0.004
	Cardiac arrest	2 (0.7%)	1 (0.2%)	0.021
	Pulmonary embolism	2 (0.7%)	0 (0%)	0.110
	Septic shock	0 (0%)	0 (0%)	0.004
	UTIs	6 (2.1%)	4 (1.0%)	0.007
	Surgical site inf.	19 (6.6%)	21 (5.3%)	0.668
	Wound inf.	21 (7.3%)	18 (4.6%)	0.224

Our study found similar results for patients who had hand amputations, regardless of whether the surgeon was an orthopedic or plastic surgeon. This suggests both specialties can effectively perform these procedures, even though their training and experience with hand surgery might differ[7,8]. It's important to note that a relatively high number of patients experienced serious complications like death or needing another surgery. This likely happened because many patients already had major health problems before the amputation, rather than being a direct result of the surgery itself. Gangrene and infections were common reasons for amputation, and no patients even had sepsis before surgery. Most patients also had a high score on an illness severity scale, indicating significant underlying health conditions. These findings suggest that patients needing amputations often have complex medical situations. Including different specialists working together as a team (multidisciplinary care) might improve outcomes for patients undergoing hand amputations.[25,26]

Our study has a few important limitations. The data comes from a database that tracks patients for few days after surgery, but it likely misses complications that happen later. This database also doesn't capture information on how well patients function in the long term, how much pain they have, or how well their amputation site heals. These are all important factors to consider, and future studies should look into them.

Conclusion

Plastic surgeons and orthopedic surgeons achieved similar results in terms of complications within the first 30 days after surgery (perioperative complications) for patients undergoing hand, wrist, or finger amputations (distal upper extremity amputations). This suggests that both specialties can provide equally high-quality care for these procedures. However, it's important to note that this study only looked at short-term outcomes. Long-term factors like pain management, prosthetic fitting success, and overall function in daily activities are also important considerations. Future research should investigate these aspects to provide a more comprehensive picture of patient outcomes.

Acknowledgements: The authors are thankful to the PGs of orthopedic department of KTH Peshawar for collection of data from the HIMS system.

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