

Common Complications in Hand Surgery and How to Prevent Them

Roberto Carlos Góngora Parga¹, David Rodríguez Arevalo¹, Omar González Catañeda²

¹Hospital Regional Universitario, IMSS Bienestar

²Hospital Civil Fray Antonio Alcalde

ABSTRACT

Hand surgery involves a variety of procedures with generally low short-term complication rates; however, a spectrum of potential adverse outcomes exists depending on the specific intervention. Common complications include infections, tendon adhesions or ruptures, nerve injuries, vascular compromise, joint stiffness, hardware-related issues, and complex regional pain syndrome. Risk factors such as patient comorbidities, operative complexity, and extended surgery duration influence complication rates. Preventative measures—meticulous surgical technique, early mobilization, and careful patient selection—are crucial for minimizing adverse outcomes. Long-term consequences, including persistent pain, joint deformities, instability, and degenerative changes, can impair function and quality of life. Psychological morbidity, notably depression and posttraumatic stress, also significantly impact recovery. A personalized, comprehensive approach emphasizing preventive strategies and close postoperative monitoring is essential to optimize both immediate and long-term outcomes in hand surgery.

KEYWORDS: Hand surgery, complications, tendon rupture, nerve injury, vascular compromise, joint stiffness, long-term outcomes, prevention, postoperative care, psychological impact

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Common complications in hand surgery vary by procedure but include surgical site infection, tendon adhesions or rupture, nerve injury, vascular compromise, joint stiffness, hardware-related issues, and complex regional pain syndrome (CRPS). The overall 30-day complication rate for hand surgery is low (approximately 2.5%), with surgical site infection being the most frequent (1.2%).[1] Risk factors for complications include advanced age, higher ASA class, comorbidities such as diabetes and cardiovascular disease, emergency procedures, and longer operative times.[1] For distal radius fracture fixation, complications include tendon irritation or rupture, CRPS, carpal tunnel syndrome, neuropathy, compartment syndrome, malunion, hardware-related symptoms, post-traumatic arthritis, stiffness, and infection. Prevention strategies involve meticulous preoperative planning, careful patient selection, and adherence to surgical principles.[2] In digital replantation, vascular compromise (arterial or venous insufficiency), infection, partial necrosis, delayed union or nonunion, and atrophy are key complications. Prevention relies on atraumatic technique, precise microvascular anastomosis, vigilant postoperative

monitoring, and early intervention for vascular compromise.[3]

Flexor tendon repair is associated with adhesion formation, interphalangeal joint stiffness, and, less commonly, tendon rupture. Early active mobilization protocols and use of shorter splints that spare the wrist are effective in reducing adhesions and stiffness. In zone 1 injuries, robust core suture techniques (e.g., 10-strand repairs) are recommended to minimize rupture risk.[4]

Carpal tunnel release may result in hypertrophic or painful scars, infection (0.36%), recurrence (7–25%), and nerve injury (0.21%). Endoscopic release is associated with higher transient nerve injury rates but lower scar-related complications compared to open release. Prevention includes careful surgical technique and appropriate patient selection.[5]

Trigger finger release can be complicated by joint contracture (2.5%), incomplete release (2.6%), bowstringing (0.1%), and neurapraxia (0.3%). Prevention involves precise identification and release of the A1 pulley while avoiding injury to adjacent neurovascular structures.[5]

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Small joint arthroplasty complications include joint instability, implant fracture or failure, recurrent deformity, stiffness, extension lag, and intraoperative fractures. Prevention is optimized by appropriate implant selection, soft-tissue balancing, and tailored postoperative rehabilitation.[6]

General strategies to reduce complications across hand surgery include optimizing comorbidities preoperatively, minimizing operative time, using local anesthesia when feasible, and favoring outpatient surgery when appropriate.[1] Early mobilization, adherence to evidence-based rehabilitation protocols, and close postoperative monitoring are critical in minimizing adverse outcomes.[2][3][4][6]

Long-term effects following hand surgery

Long-term effects of complications following hand surgery are diverse and depend on the underlying pathology, surgical procedure, and specific complication. Persistent pain and functional impairment are common sequelae across multiple hand surgeries. For example, after operative treatment of distal radial fractures, patients may experience chronic tendon irritation or rupture, complex regional pain syndrome (CRPS), carpal tunnel syndrome, neuropathies, post-traumatic arthritis, malunion, and stiffness, all of which can result in lasting disability and reduced hand function.[1] Similarly, after surgery for acute perilunate injuries, long-term complications include post-traumatic arthritis (up to 30%), carpal instability, avascular necrosis, and CRPS, each contributing to chronic pain, reduced range of motion, and diminished grip strength.[2]

Procedures such as open carpal tunnel release are associated with persistent symptoms including scar tenderness, pillar pain, burning discomfort, and neuroma formation, which can persist for years and impact hand use.[3] Both open and endoscopic carpal tunnel release can result in hypertrophic or painful scars, recurrence of symptoms, and, rarely, permanent nerve injury, all of which may lead to chronic sensory or motor deficits.[4]

Total wrist arthroplasty and wrist arthrodesis are associated with high rates of late complications. After arthroplasty, periprosthetic osteolysis, implant loosening, and instability may necessitate revision surgery or conversion to arthrodesis, with subsequent reduction in wrist motion and function.[5] Long-term outcomes after wrist arthrodesis include substantial reduction in grip and pinch strength, loss of pronation and supination, persistent pain, and a high rate of re-operations, with many patients never fully adapting to the loss of wrist motion.[6]

Beyond physical sequelae, psychological morbidity is significant. Patients with severe hand trauma requiring surgery have high rates of persistent depression and posttraumatic stress disorder, with psychological distress closely linked to ongoing pain and disability.[7]

CONCLUSION

Hand surgery carries a relatively low short-term complication rate, with infection being the most common. Nonetheless, a wide spectrum of complications can occur depending on the specific procedure, including tendon adhesions, nerve or vascular injury, joint stiffness, hardware issues, and complex regional pain syndrome. Recognizing and managing risk factors—such as patient comorbidities, surgical complexity, and operative duration—are vital for reducing adverse outcomes. Preventative strategies, including meticulous surgical techniques, careful patient selection, early mobilization, and thorough postoperative monitoring, are essential across all hand procedures. Long-term complications, such as persistent pain, joint instability, and degenerative changes, often lead to functional impairment and reduced quality of life. Additionally, psychological effects like depression and post-traumatic stress are significant concerns. Overall, adopting a comprehensive, personalized approach enhances surgical success and improves long-term functional and psychological outcomes in hand surgery.

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