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20.1 Introduction

The aging of the global population is rising due to a sustained decline in birth rates alongside increased longevity, a result of advancements in both preventive and curative medical interventions [1].

Comorbidities in the elderly often present as a pathological bundle that requires multidisciplinary assessment and combined therapeutic strategies tailored to the stage of the disease, and assessment of the status of the individual's overall health is often required to manage these complexities.

Estimates of GFR in humans support hyperfiltration as a relevant pathophysiologic mechanism. Elevated GFR is combined with risk factors for disease progression, which include obesity, a family history of end-stage renal disease (ESRD), and increased glomerulosclerosis and atherosclerosis. These factors indicate a compensatory mechanism in the remaining neurons to maintain total GFR [2, 3]. The decline in kidney function in chronic kidney disease (CKD) is initially typically asymptomatic. However, as renal function deteriorates, patients may exhibit symptoms of advanced kidney failure, including volume overload, hyperkalemia, metabolic acidosis, hypertension, anemia, and mineral and bone disorders. The onset of ESRD presents with a constellation of signs and symptoms collectively referred to as uremia. Following progression to ESRD, kidney transplantation becomes the

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treatment of choice, and is the most widely performed solid organ transplant. Compared to maintenance dialysis, transplantation improves the quality of life and reduces the risk of mortality for most patients. The complexity of managing elderly surgical patients is compounded by a longer recovery period and an increased risk of complications, which can have a significant impact on prognosis. Postoperative complications can lead to prolonged hospital stays, readmissions, and a decline in patient quality of life [4].

This chapter delves into the specialized field of geriatric surgery, focusing on the unique challenges and considerations when operating on elderly uremic patients. It explores the intricacies of surgical care in this demographic, highlighting age-related factors and perioperative challenges that must be addressed for optimal outcomes.

20.2 Surgical Care for Elderly Uremic Patients

Considering the many different conditions that can affect kidney function, a complete evaluation is imperative in patients with renal dysfunction undergoing surgery.

The National Kidney Foundation recommends the following assessments for uremic patients:

- Diagnosis (specific kidney disease)
- Comorbidities
- Severity, estimated by renal function level
- Complications associated with renal function level
- Risk of loss of kidney function
- Risk of cardiovascular disease.

These are the most important evaluations for accurate preoperative assessment, but it is mandatory that a complete multidisciplinary surgical risk work-up be performed to tailor surgery.

Uremic patients often have multiple major comorbidities, and the primary purpose of the preoperative evaluation must be to optimize the variable risk factor status before surgery [5].

Cardiac complications are the most common cause of perioperative complications and death in surgical patients of all ages, but especially in the elderly. This is because patients often have concurrent cardiac impairment, combined with poor functional reserve. The combined effects of intravascular volume depletion, age-related impairment of catecholamine responsiveness, and prolongation of myocardial relaxation time adversely affect cardiac function in an elderly patient under stress in the perioperative period [6]. Pulmonary complications account for up to 50% of postoperative complications and 20% of preventable deaths. Risk factors for pulmonary complications include a positive smoking history, the presence of shortness of breath, or clinical evidence of chronic obstructive pulmonary disease [7]. There is also an increased incidence of renal complications in the perioperative

period in elderly surgical patients. Renal size and volume decrease with age, accompanied by intrarenal vascular changes. The number of glomeruli and nephron mass is reduced, resulting in a decreased filtering area. However, serum creatinine concentration is an insensitive indicator of renal function in the elderly.

Functional assessment is an important part of the preoperative evaluation of elderly surgical candidates, including an assessment of cognitive function. This will ensure that surgery will not have a significant impact on the quality of life of an elderly surgical candidate. An elderly patient's functional status directly and inversely correlates with pulmonary and cardiac complications that can follow surgery [8]. Performing surgery in elderly patients must be a considered compromise of surgical strategies in order to minimize perioperative complications.

Laparoscopic surgery has become an attractive option in elderly patients in all abdominal specialties due to advances in surgical techniques. A comprehensive multidisciplinary preoperative evaluation is essential to identify appropriate surgical candidates. Morbidity and comorbidity factors must be considered. Elderly patients are particularly susceptible to adverse surgical outcomes due to more severe primary disease, higher comorbidity burden, and reduced functional reserve. Some technical problems must also be considered, as well as prolonged operative times, increased pulmonary and systemic vascular resistance due to pneumoperitoneum, and potential heart failure, which leads many surgeons to limit the use of laparoscopic techniques in elderly patients. However, the benefits of reduced operative time and blood loss, earlier postoperative mobilization, and improved enteral tolerance have become apparent in all age groups as surgical techniques have been perfected. It is now becoming accepted that the laparoscopic approach may have special advantages for the elderly patient [9].

A wider range of conditions, both cancerous and benign, may require surgery in older patients. The impact of age-related impairments in immune function can be exacerbated by coexisting medical issues and changes in mental status as a result of dementia, medications, infection, or nutritional deficiencies. Biliary diseases, including acute cholecystitis, intestinal obstruction, and incarcerated hernia, are the most common benign surgical emergencies in the elderly. Often these are conditions that are delayed or misdiagnosed in the elderly. This frequently results in higher rates of perforation and complications that have a negative impact on morbidity and mortality. This is perhaps due to age-related changes in the biliary system, such as an alteration in the lithogenicity of bile, and an associated increase in the prevalence of cholelithiasis. Complications such as ascending cholangitis, gallbladder perforation or gallstone ileus can result from delayed diagnosis due to atypical or misleading symptoms. Because of a suppressed immune response, elderly patients with acute peritonitis may not present with the typical symptoms of acute abdominal pain, fever, or leukocytosis [10].

Most cancers are age-related, and a growing elderly population is rapidly resulting in an increasing number of older patients requiring multidrug therapy for a variety of cancers, including lung, breast, hepatobiliarypancreatic (HPB), gastric, and colorectal cancers. The development of a multimodal treatment plan for an elderly patient with a surgically resectable malignancy is based on careful consideration of

the expectation of the patient's life expectancy. The major potential risk associated with major HPB surgery in elderly patients is the expected higher risk; therefore, a better understanding of the surgical risk is critical in optimizing management in these patients.

Liver resection (Fig. 20.1) and pancreatic surgery (Fig. 20.2) are the treatment of choice for a variety of primary and secondary cancers. Primary tumors of the liver are one of the most common solid tumors in the world, and the incidence of hepatocellular carcinoma (HCC) is the fourth highest of all tumors. HCC is often associated with cirrhosis, and can occur 20–30 years after exposure to the injury. Nevertheless, 25% of patients show no risk factors for developing cirrhosis. Extensive liver dysfunction limits treatment options, and many patients die from liver failure due to tumor progression. The incidence of HCC is most common in the sixth decade of life, and the number of elderly HCC patients being referred for liver surgery is growing due to the aging of the world's population [11].

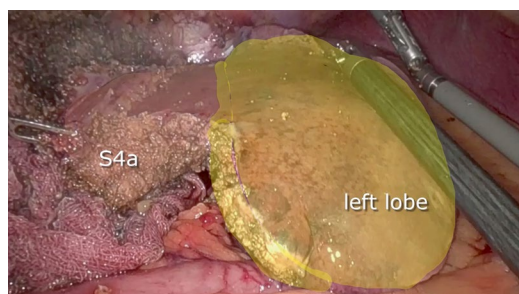


Fig. 20.1 Robotic liver resection in geriatric uremic patient. Major open surgeries often require large fluid shifts, prolonged anesthesia, and increased stress response, all of which can worsen renal function in uremic patients. Robotic surgery minimizes these risks by reducing operative time, hemodynamic fluctuations, and fluid requirements, preserving residual renal function. Advanced robotic technology allows for safe resection of tumors in difficult liver segments (e.g., posterior or caudate lobe) without the need for large incisions

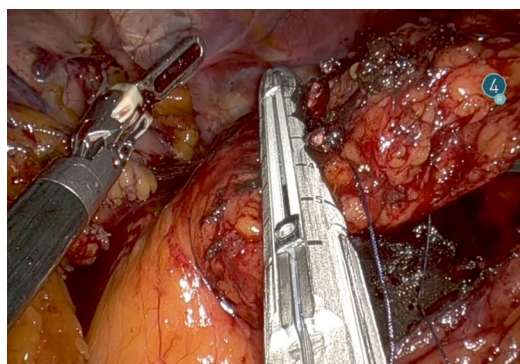


Fig. 20.2 Robotic pancreatic resection in geriatric uremic patient. Enhanced 3D visualization and instrument dexterity allow precise dissection of the pancreas and spleen, reducing trauma to surrounding structures. Geriatric uremic patients often have multiple comorbidities, making open surgery riskier, whereas robotic surgery offers a safer, less invasive alternative

20.3 Age-Related Considerations and Perioperative Challenges

In frail patients, surgery can be particularly dangerous and lead to irreversible functional decline. Quality care for elderly surgical patients should achieve patient-centered outcomes and requires clear communication and coordination among many health care professionals. Enhanced recovery after surgery (ERAS) and prevention are an interesting combination that can improve the health status of the elderly frail patient. These pathways could potentially increase the ability of these patients to tolerate the stresses of surgery. ERAS programs are treatment regimens that combine evidence-based changes in perioperative care with the goal of reducing organ dysfunction and optimizing patient performance status. This program involves an evaluation by a multidisciplinary medical team, including surgeons, anesthesiologists, physical therapists, and nurses with the goal of optimizing the perioperative course of elderly patients [12].

20.4 Conclusions

Surgical decisions in the elderly should be individualized. Potential benefits should be weighed against predicted risks. Preoperative assessment that evaluates medical, functional, and psychosocial problems can improve surgical outcomes in older patients by highlighting medical conditions that may adversely affect outcome, especially when associated with age-related physiologic changes. Specific interventions to minimize complications such as functional decline and malnutrition are included in postoperative management. Planning for discharge begins with preoperative assessment.

A comprehensive assessment and interdisciplinary collaboration can improve the outcomes of the elderly patient while at the same time mitigating the potential adverse effects of hospitalization. Therefore, careful preoperative assessment, including screening for and addressing modifiable health concerns, is paramount in preventing adverse outcomes. Surgeons, anesthesiologists, and the entire surgical team must be aware of the unique needs of the aging population in order to implement appropriate measures to ensure patient safety and optimize surgical outcomes.

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