CHAPTER – 19

Frailty and Spinal Surgery

Background:

Several approaches for assessing frailty have been proposed, all of which rely on measuring physical functions, such as accumulation of deficits and frailty phenotype, where application is dependent on clinical availability, and/or self-reported items on strength, energy, and weight loss. Furthermore, specific techniques have been developed in specific circumstances; therefore there is still a lack of agreement on distinguishing diagnostic criteria. [1]

Frailty is linked to the result of general surgery, therefore it could predict the prognosis of patients undergoing spine surgery, who have a high rate of intra- and post-operative problems.[2] Degenerative disorders of the spine are common, with 90% of adults demonstrating some degree of lumbar disc or spine degeneration by the age of 50. [3] Degeneration of the spine can manifest as disc degeneration, spinal stenosis, facet hypertrophy, osteophytosis, foraminal stenosis, and instability, all of which can cause back discomfort and/or neurological symptoms. Back pain affects 15% to 20% of adults each year, and around 17.000 new cases of spinal column injuries are reported in the United States each year.[4, 5]

Furthermore, along with proximal femoral and wrist fractures, vertebral fractures are the most common osteoporotic fractures among the elderly. 30–70% of individuals with initial malignancies develop spinal metastases, which can cause spinal cord compression, discomfort, spinal instability, and pathologic fractures.[6] This chapter aims to explain in detail about the influence of frailty on the spinal surgical procedures.

Frailty and Spine Surgery:

Spine surgery will need to expand as the population ages, in order to reduce neurologic adverse events and pain. Because spine surgery is associated with problems or even death, it is critical to identify individuals who are at higher risk prior to surgery, in order to reduce health-care expenses.As people get older, degenerative spine disease becomes more common and can be devastating. Complex spine surgery may provide relief, but it increases riskier as people get older. Only after the decision to have surgery are efforts to reduce the physiological impact of surgery through minimally invasive procedures and enhanced recovery programmes made to reduce risk.[7]

Traditional perioperative risk classification techniques are outperformed by frailty assessments. Frailty predicts post-surgery complications like reoperation for infection and 30-day mortality, as well as social cost factors like hospital length of stay and discharge to an advanced care facility. Different frailty evaluation techniques may function differently in people with degenerative spine disease because symptoms of spine illness overlap with phenotypic markers of frailty.

However, cognitive decline and psychosocial isolation, in addition to frailty, may interact with frailty and impact surgical results. Prehabilitation, which has been shown to lower perioperative risk in colorectal and cardiac surgery, may be beneficial to individuals who are considering difficult spine surgery. Physical exercise, nutritional supplementation, and behavioural treatments are common forms of prehabilitation that may provide clinical alleviation even in the absence of surgery.[8]

Adult spinal deformity (ASD):

ASD is a disabling disorder that has a significant influence on the health-related quality of life of patients. While there are a variety of causes for ASD, the most common cause appears to be age-related spine degeneration. Between 2000 and 2010, the incidence of ASD and surgical correction quadrupled due to an ageing population. [9] Although ASD correction

surgery has been proven to be effective, working with an older population often entails dealing with individuals who have other comorbidities. Surgical outcomes are determined not only by the success of the procedure, but also by the risk factors identified before to surgery. Several researches have been conducted to assess the impact of frailty and create robust techniques for forecasting risk profile and outcomes in order to solve this issue in ASD correction. [10]

Frailty indices and spine surgeries:

In comparison to non-orthopedic literature, the spine literature contains limited studies on frailty indices. The majority of studies on frailty indices are retrospective analyses of prospectively collected databases, in which a frailty index score is retrospectively evaluated using preoperative medical history to associate high frailty index scores with an increased postoperative complication rate. Higher degrees of frailty are associated with a higher risk of death, postoperative complications, longer hospital stays, and more likelihood of discharge to a rehabilitation facility in both general surgery and, specifically, spine surgical populations, according to the data. The effectiveness of a frailty index to predict postoperative problems varies depending on the study population, procedure invasiveness, and frailty index used.[7]

Although multiple frailty indices exist, those leading in the spine literature are as follows:

- modified frailty index (mFI)
- Charlson Comorbidity Index (CCI)
- Adult Spinal Deformity Frailty Index (ASD-FI) and
- Cervical Deformity Frailty Index (CD-FI).

There is no unanimity on which indicators should be utilized to assess the amount of frailty in spine surgery. While some studies have employed a combination of medical, functional, and laboratory parameters to evaluate a frailty score, others have utilised a combination of medical, functional, and laboratory measurements. Given the complex character of

the disease, there is a universal understanding that no one biomarker can be used to assess frailty on its own.

Although both the frailty index model and the frailty phenotypic assessments have advantages and disadvantages, some have concluded that the frailty index model, which quantifies the idea of frailty, is the most versatile and has the greatest relevance for both research and clinical usage.A spine-specific frailty index could be a valuable objective measure for a variety of applications, such as preoperative screening for high-risk patients and assessment of the complication rate for use in multidisciplinary conferences, particularly for high-risk ASD patients.[10]

Preoperative screening utilising a frailty index, followed by a multidisciplinary evaluation of surgical decision-making, has been shown to significantly reduce postoperative mortality in elective surgery.Elevated frailty index scores have been shown as an independent predictor of surgical complications in the spine group. Preoperative screening with a frailty index could identify high-risk patients who would then be eligible for a multidisciplinary conference to review their condition.[11]

The Charlson Comorbidity Index (CCI) is a frequently used comorbidity index that predicts mortality by weighting comorbidities. The CCI, which was created to predict 10-year survival rates, now predicts patients' 10-year death based on 19 comorbidity categories. Each ailment is assigned a value of 1,2,3, or 6 based on the related risk of mortality, with the score increasing by one point for every decade beyond 50.[12]Although some recent studies demonstrate that the CCI can predict significant complication rates in degenerative spine surgery, the results are mixed. Furthermore, no studies have been published that look at how comorbidities affect clinical outcomes in adult spinal surgery.[10]

Because only variables with the strongest link to poor outcomes are selected, specialty-specific indices, such as the Metastatic Spinal Tumor Frailty Index, could predict postoperative outcomes with more accuracy. The development of a spine-

specific frailty index, which includes radiographic and/or pertinent laboratory markers, could have enhanced the connection between index score and complication rate.[7]

Impact of frailty on spinal surgery:

As value-based healthcare models become more common, risk stratification in terms of perioperative complications and long-term outcomes is becoming more relevant. With an ageing population and an increase in the number of patients receiving spine surgery each year throughout the world, it's more crucial than ever to be able to accurately anticipate surgical outcomes. Frailty is a metric that is increasingly being used in a variety of surgical disciplines. Frailty indices can take into account the severity of existing co-morbidities and functional limitations to provide a more accurate picture of a patient's surgical risk profile. [13] Frailty indices for prognostication in spine surgery are a new concept that has gained popularity in recent years.

With an increasing senior population, spine surgeons are seeing elderly patients more frequently, resulting in a higher demand for risk assessment and cost-benefit analysis. The focus has always been on how age influences surgical results. In other surgical disciplines, the focus has shifted to frailty rather than age. The impact of frailty on outcomes following spine surgery is currently understudied.[14] One vital part of the decision-making process is understanding how frailty affects risk stratification in spine patients. We need to understand how frailty affects patient outcomes in order to correctly assess costs versus benefits in the aged and frail population.

Frailty is predicted to become more common and significant to this population as the likelihood of complications following spine surgery rises and the average age of patients receiving spine surgery rises. Despite these potential consequences, nothing is known regarding the frequency of frailty in the spine surgery population, or how frailty affects postoperative outcomes in this vulnerable group.[15] A study by Flexman et al suggested that frailty is an important predictor of postoperative

outcomes following degenerative spine surgery. Furthermore, the authors concluded that preoperative recognition of frailty may be useful for perioperative optimization, risk stratification, and patient counselling.[16]

Summary:

Inpatient head and neck surgery, as well as surgical intervention for adult spinal deformity and degenerative spine disease, frailty has been shown to be a predictor of morbidity and mortality.The currently known frailty indicators are competent for predicting perioperative complication risk and could be beneficial in preoperative screening and surgical management of geriatric spine patients.

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