Editorial

Prognosis control surgery

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Despite the advent of the Internet and the era of big data, as well as the gradual application of information technology (IT) modalities such as artificial intelligence (AI) to the medical field, traditional medical science research is still predominantly concerned with the experience of the surgeons and takes an evidence-based approach, the impact and challenges of which vary by treatment (1). With the rapid development of medical sciences and technology, new and advanced methods of disease diagnosis and treatment are emerging. These high-tech approaches allow for early diagnosis and treatment, and challenge the classical concepts within their respective fields. It is important to integrate the clinical experience of the surgeons with high-level evidence-based medical science and IT modalities to achieve optimal therapeutic efficacy through effective management of disease risk. For long-term clinical application, we here propose the theory of "prognosis control surgery" (PCS) for the routinization of minimally invasive surgery and the simplification of complex surgery, with the aim of achieving the maximum clinical benefit with minimal treatment-related injury to patients.

Concept

Informed by the current scientific, medical, and technological trends, we propose the concept of PCS to anticipate the risks of surgery and ensure that the choices of surgeons and treatment, and the timing thereof, are optimized to achieve the best prognosis (2). For this, AI and other IT modalities can be used to ensure the best therapeutic effect (3). PCS pertains to surgical practices empowered by medical sciences and technology, provides a theoretical framework for assessing surgical risk, and facilitates clinical decision-making, clinical treatment, and prognostic analysis. The surgeons can optimize patient prognosis by reengineering the diagnosis and treatment only if the concept of PCS is applied during all perioperative stages.

PCS is not only an innovative medical concept, but also represents a complete theoretical system for risk control and maximization of patient benefits in all stages of disease. In addition, PCS theory has been continually refined to keep pace with the rapid development of medical sciences and technology. We can use AI to better serve patients and meet the growing demands for treatment.

The four elements of PCS

Risk of disease, surgeons, treatments, and the treatment timing are the four key elements of PCS. By addressing these four key elements in clinical practice, diagnosis and treatment can be improved so patients can achieve the best prognosis.

(I) Disease risk encompasses the possible adverse outcomes associated with the target disease itself, and the possible risks posed by any preexisting underlying diseases. In hepatocellular carcinoma (HCC) patients, the presence of severe liver cirrhosis significantly increases the risk of intraoperative bleeding and postoperative liver dysfunction. The aim of surgical treatment should be to achieve the best outcome while also minimizing risk.

(II) Surgeons are responsible for diagnosis and treatment. The choice and timing of the treatment are determined based on the experience and

competence of the surgeons, who should be highly skilled and have extensive clinical experience with respect to clinical decision-making, diagnosis, and treatment. Surgeons also need to be cognizant of the most recent developments in medical science technology, and should be proficient in using IT modalities such as big data and AI to improve treatment effectiveness and timeliness (4). Surgeons must also control their own emotions to meet the psychological needs of patients, and thus improve diagnosis and treatment.

(III) Appropriate selection and use of treatments to diagnose and treat disease is necessary to achieve a good prognosis. The use of AI has constituted a revolution in the medical and surgical fields, improving existing diagnostic and treatment modalities and promoting more innovative approaches (5). Through in-depth human–computer interactions, the effectiveness of surgeons and treatments can be maximized to ensure reliable, efficient, and individualized treatment (6).

(IV) The timing of treatments is guided by the risk management approach of the surgeons for a given treatment, where treatment timing is subjective. Appropriate treatment timing improves efficacy. Clinically, surgeons must assess the relationship between disease risk and treatment risk, and time the treatment accordingly.

The ultimate goal of optimal prognosis

In the context of medicine, prognosis refers to the prediction of the disease course and outcome. More than 2,000 years ago, in his work *On Prognosis*, Hippocrates stated that the prognosis of a disease should be determined based on clinical observations and analysis, and also that prognostic accuracy reflects the skill level of the surgeons (7).

Scientific and technological progress is a powerful driving force in the recent developments in the medical sciences. Surgeons must not solely focus on the technology itself, emphasizing the application of new technologies and services at the expense of the underlying purpose of treatment, which is to improve the prognosis of patients. The prognosis of patients is the most important indicator of the quality of treatment, and optimizing prognosis should be the primary goal of disease diagnosis and treatment. As medical subspecialties become more subdivided and the choice of treatments more diverse, the expertise of surgeons has become more specialized. With optimal prognosis as the ultimate goal, selecting the most appropriate surgeons, treatment, and timing thereof are critical for high-quality clinical treatments.

Disease risk management as an implementation process

According to PCS theory, medical treatments should minimize disease risk; this is also known as disease risk management. The risk management process is divided into two parts: risk assessment and risk control. During the process of risk assessment, it is important to identify risks pertaining to the disease, the surgeons, and the treatment and the timing thereof. After comprehensive risk identification, the identified risks can be assessed. The risks delineated above are not independent; rather, they are interrelated, interactive, and mutually transformable. According to PCS theory, risk control is the most important process for reducing the likelihood of adverse outcomes (8). Traditional treatment concepts focus on disease risk, while PCS considers the risks associated with the surgeons, treatment, and timing thereof, and emphasizes that disease- and treatment-associated risks are related. Controlling these risks through comprehensive and practical management, according to the principles of PCS, should optimize patient outcomes.

Optimal combination of three factors of treatment

Surgeons, treatment, and timing thereof are the three most important factors of treatment. These three elements do not exist in isolation; rather, they are interrelated and interactive. It is important to continually monitor and adjust the three elements, to ensure optimal prognosis and maximize benefits to patients.

Due to differences in educational background and experience, there is significant variation in competence and experience among surgeons, such that the accuracy of treatment selection and timing also varies. In the existing medical model, selection of the optimal treatment is overemphasized compared to assessment of whether the surgeons are actually capable of competently performing that treatment. Without an evaluation of surgical skill and experience, the surgeons and treatment cannot be well matched. Uniquely, PCS-based evaluation considers

the expertise of the surgeons with respect to different treatments, so that the treatment and timing thereof is selected appropriately and objectively.

In summary, decision-making guided by PCS differs from conventional decision-making, which typically takes an evidence-based approach and involves multiple disciplinary teams. PCS, based on conventional decision-making, is able to minimize treatment-related injury and maximize patient benefit by pre-assessing and controlling the risks of disease and treatment, and selecting the treatment methods and timing thereof in a reasonable manner.

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