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Guidelines for Transcatheter Aortic Valve Replacement in Korea: Past Obstacles and Future Perspectives

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Background: Analyses of the efficacy and safety of transcatheter aortic valve replacement (TAVR) in most countries have been based on outcomes obtained in accordance with national practice guidelines and monitoring protocols. The purpose of this study is to share our experience regarding the process for establishing guidelines and monitoring protocols for the use of TAVR in Korea, in the hopes that it may be helpful to others undergoing a similar process in their own country. **Methods:** The Korean guidelines for TAVR were established on June 1, 2015 in through a tri-party agreement involving the Department of Health and Welfare, the Korean Society of Thoracic and Cardiovascular Surgery and the Korean Society of Cardiology. We agreed to monitor the guidelines transparently and to exchange opinions regarding amendments or continuation of its contents after 3 years of monitoring. **Results:** The monitoring meetings were not held as regularly as agreed, and monitoring was also made difficult by insufficient and incomplete data. Nevertheless, during the meetings, measures to improve the monitoring process were discussed, and accordingly, an agreement was made to continue the monitoring process, with the aim of completing data collection by 2018. **Conclusion:** Compliance with guidelines is critical for assessing the efficacy and safety of TAVR. Moreover, the TAVR monitoring process must be properly conducted for an accurate evaluation to be made. Any country planning to introduce TAVR may encounter difficulties with regards to the optimal initiation strategy and subsequent monitoring. Nevertheless, continued efforts should be made to persuade the government and the corresponding medical societies to facilitate the optimal application of TAVR.

Key words: 1. Transcatheter aortic valve replacement/implantation
2. Aortic valve stenosis
3. Guidelines
4. Monitoring
5. Safety and efficacy

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Introduction

Aortic stenosis is becoming an increasingly common valvular heart disease in the elderly. Recently, transcatheter aortic valve replacement (TAVR) has emerged as a viable treatment option for patients with high-risk or inoperable severe aortic stenosis. The volume of TAVR has dramatically increased since its seminal case presented by Cribier et al. [1] in 2002. The success of this case led to more and more surgical aortic valve replacements (SAVR) being replaced by TAVR as the primary therapy of choice.

Despite the increasing importance of TAVR, many Western countries with high-volume TAVR practices have come to recognize certain limitations of TAVR in comparison with surgical treatment as experience has accumulated. Consequently, many countries have established their own practice guidelines and monitoring protocols for the safe and effective application of TAVR. For this purpose, a multidisciplinary team approach seems to be the best method for identifying ideal candidates and devising intraoperative and postoperative management strategies. Serial publications regarding the outcomes of TAVR have attributed significant improvements over time to not only an increasing depth of experience, but also to the evolution of newer-generation devices aimed at addressing the limitations of earlier devices.

The Korean Society of Thoracic and Cardiovascular Surgery (KTCVS) has continually stressed the necessity of developing adequate guidelines and monitoring protocols for these purposes since the first TAVR procedure was performed in Korea in 2010. The Korean guidelines for TAVR were established in June 2015 through a tri-party agreement that included the Korean government and the Korean Society of Cardiology, as well as the KTCVS. Currently, data collection for monitoring the outcomes of TAVR in Korea is an ongoing process. Through this study, we aim to share our experiences in establishing the TAVR guidelines and monitoring protocols.

The enactment process of the Korean guidelines for transcatheter aortic valve replacement

After the first TAVR procedure was performed in Korea in 2010, it was primarily performed in several select hospitals without medical insurance coverage. Meanwhile, the Korean government and the Korean Medical Association came to recognize TAVR as a potentially effective and useful procedure for treating patients with high-risk or inoperable severe symptomatic aortic stenosis. However, data were lacking to compare the intermediate- to long-term outcomes of TAVR to those of SAVR with regard to cost-effectiveness, safety, and efficacy. In August 2013, the medical practice assessment committee of the Korean government concluded that further evaluation of TAVR was needed in this regard. The TAVR advisory committee, composed of members from the KTCVS, the Korean Society of Cardiology, and the Korean government, was organized in 2014 to address this very issue. The development of Korean guidelines for TAVR was initiated in April 2014. Discussions were held with the specific aim of establishing the indications, contraindications, and standards for the implementation of TAVR and related evaluation methods. We made efforts to follow the original guidelines for TAVR established by the United States [2], European Union [3], and Japan [4]. However, subsequent negotiations were needed to develop our own guidelines adapted to our medical situation. In addition, medical expenditures related to TAVR were supposed to be reimbursed following Korean guidelines, and a corresponding administrative decree was enacted. Previously, a tri-party agreement was arrived at for a similar model, involving a heart team approach, for the treatment of coronary artery disease in Korea. However, in reality, there were limitations regarding the degree to which the ideal role of the heart team was fulfilled for this disease entity. Based on previous experiences, negotiations resulting in a tri-party agreement were conducted to develop the Korean guidelines for TAVR, with the goal of improving its implementation. After a total of 3 TAVR advisory committee meetings, held from May 20, 2014 to October 27, 2014, all members were satisfied that the newly enacted Korean guidelines for TAVR adequately reflected our national circumstances. In addition, further clauses to reinforce standards for qualified manpower, facilities, and equipment were added. The Korean guidelines, including stipulations for further monitoring, were finalized on December 27, 2014, after all members of the advisory committee agreed to the content.

The major difference between the Korean TAVR guidelines and those of other nations (e.g., the United States and Japan) is that all aspects of our regulations regarding indications, contraindications, and standards for TAVR application were loosened to provide greater opportunities for hospitals wishing to perform TAVR. The committee ultimately agreed that all TAVR procedures should be performed by a heart team during the mandatory 3-year monitoring period, after which further revisions could be made to the guidelines as needed. During this period, the government decided on a policy of 20% reimbursement for medical expenditures related to TAVR by the national medical insurance program, which was the first model of conditional coverage in Korea. Any future amendments modifying the reimbursement proportion would only become possible after June 2018, following the final analysis of the 3-year TAVR monitoring period. Based on these provisions, the Korean guidelines for TAVR were established by an administrative decree on June 1, 2015 (Appendices 1, 2).

The course of transcatheter aortic valve replacement monitoring since the establishment of the Korean guidelines

A preliminary meeting for monitoring activities was held under the auspices of the Health Insurance Review and Assessment Service (HIRA; March 30, 2015) prior to the launch of the advisory committee for establishing the Korean guidelines for TAVR and the monitoring protocol. The monitoring advisory committee members consisted of 2 reviewers from the HIRA, 2 members of the medical practice assessment committee, 3 members each of the KTCVS and the Society of Cardiology, and a statistical advisor. The statistical advisor was included in the monitoring advisory committee for assistance with analyzing the results of the upcoming 3-year monitoring period (June 2015 to May 2018). It was agreed that the participating hospitals should monitor outcomes at 5-time points after TAVR (before discharge, 30 days to 6 months, 1 year, 2 years, and 3 years) and submit their results for scrutiny by the advisory committee. The first monitoring meeting took place with the HIRA 6 months after the Korean guidelines were implemented (December 14, 2015). Upon review of the monitoring results during the previous 6 months (June 1, 2015 to November 30, 2015), the committee found that the data were insufficient and that no reasons were provided for not strictly abiding by the set indications for TAVR (Table 1). The committee decided to collect further revised monitoring data within the next 3 months from the participating hospitals, and held a follow-up meeting. The administrative decree for TAVR was modified accordingly on February 2, 2016, after the first meeting (Appendix 2).

Table 1. Follow-up monitoring data of TAVR (June 1, 2015 to November 30, 2015)

Variable	No. of patients (%)
Heart team approach	
Total	64 (100.0)
All participants	46 (71.9)
Some participants	18 (28.1)
Cardiologist: 2 cardiologists	64 (100.0)
Cardiac surgeon	
2 Participants	62 (96.9)
1 Participants	2 (3.1)
Anesthesiologist	
Participation	60 (93.7)
No participation	4 (6.3)
Radiologist	
Participation	46 (71.9)
No participation	18 (28.1)
Reason for deciding to perform TAVR	
Total	64 (100.0)
Following indications	14 (21.9)
Consideration of risk due to old age and comorbidities	33 (51.6)
Patient's wish	13 (20.3)
No reason	4 (6.2)
Standby staff (cardiac surgeon, perfusionist)	
Total	64 (100.0)
Standby	20 (31.3)
No standby	44 (68.7)

TAVR, transcatheter aortic valve replacement.

The second monitoring meeting was not held as scheduled, although the KTCVS made several requests through February 2017 that the HIRA hold the meeting. It was not until March 2, 2017 that the second monitoring meeting was held (Table 2). However, the meeting was not productive, as the monitoring data submitted by the HIRA for review were generally incomplete. After this meeting, it was agreed that further monitoring meetings should be

Table 2. Follow-up monitoring data of TAVR (December 1, 2015 to June 30, 2016)

Variable	No. of patients (%)
Heart team approach	
Total	153 (100.0)
All participants	145 (94.8)
Some participants	8 (5.2)
Cardiologist: 2 cardiologists	153 (100.0)
Cardiac surgeon	
2 Participants	147 (96.1)
1 Participants	6 (3.9)
Anesthesiologist: participation	153 (100.0)
Radiologist	
Participation	151 (98.7)
No participation	2 (1.3)
Reason for deciding to perform TAVR	
Total	153 (100.0)
Following indications	53 (35.3)
Consideration of risk due to old age and comorbidities	80 (51.7)
Patient's wish	12 (7.8)
No reason	8 (5.2)
Standby staff (cardiac surgeon, perfusionist)	
Total	153 (100.0)
Standby	93 (60.8)
No standby	50 (32.7)
No answer	10 (6.5)
Standby of heart-lung machine or extracorporeal membrane oxygenation	
Total	153 (100.0)
Yes	91 (59.5)
No	62 (40.5)

TAVR, transcatheter aortic valve replacement.

routinely held at least every 6 months, with HIRA submitting complete monitoring data with all relevant information for proper evaluation.

The last monitoring meeting was held on July 4, 2017, at which time all advisory committee members agreed to stricter enforcement of the TAVR guidelines, revisions of some clauses to improve the guidelines, and clearer representation to avoid misinterpretation or confusion. The committee also agreed to ensure that the statistical data analysis would be objective through outsourcing to a third party; on this basis, the cost-effectiveness of TAVR, its outcomes, and medical reimbursement will be discussed in 2018 after 3 years of monitoring.

Discussion

TAVR is a relatively new and evolving technology for treating patients with high-risk or inoperable severe symptomatic aortic stenosis. Since the indications for TAVR have been updated to include intermediate-risk patients as a class IIa indication in the most recent American College of Cardiology (ACC)/American Heart Association TAVR guidelines [5], it has become increasingly likely that TAVR will be applied to even lower-risk patients in the real world, without the scrutiny of objective clinical trials. TAVR has already been performed in over 100,000 cases worldwide, and in the United States alone, which is one of the leading nations performing TAVR, over 50,000 TAVR procedures have been conducted since Food and Drug Administration approval in 2011 [6].

Many clinical trials, including the PARTNER (Placement of Aortic Transcatheter Valve) and SURTAVI (Surgical Replacement and Transcatheter Aortic Valve Implantation) trials that are underway, have published comparative TAVR outcomes for a variety of endpoints, including survival, associated complications, cost-effectiveness, and quality of life. However, the objective evaluation of each step of TAVR implementation is complex, as the usual TAVR candidates are high-risk patients with multiple comorbidities. Furthermore, the evaluation of TAVR must account for several issues, including standards regarding the facility where the procedure is performed, the preoperative evaluation for deciding upon suitability for TAVR, the experience of the surgeon, and the adequacy of training, not only for conducting the actual procedure, but also (perhaps more importantly) to effectively deal with difficult complications and postoperative care. Therefore, for the overall success of TAVR, it is essential for the heart team to function properly; this involves obligatory cooperation between the cardiac surgeon and the cardiologist. Historically, TAVR was launched in 2010 in Korea by several hospitals, without the benefit of government reimbursement by the national health insurance system. However, the Department of Health and Welfare and the relevant professional medical societies have recognized TAVR as a new technology that should, in principle, be managed through a multidisciplinary heart team approach. With this general

consensus, the advisory committee for establishing TAVR guidelines in Korea was formed. The KTCVS led efforts to revise, rather than to simply adopt, the existing published guidelines from other nations in order to accommodate the differences in the medical systems and conditions under which TAVR may be performed in Korea. Therefore, to design and establish our own TAVR guidelines that would be optimally suited to the Korean medical environment, the current TAVR guidelines and standards of use were modified, using those in the United States [2], European Union [3], and Japan [4] as references.

The original TAVR guidelines were revised during 3 TAVR advisory committee meetings with regard to the indications, contraindications, and all standards for human resources, facility, and equipment appropriate to the Korean medical environment. As the role of the heart team approach was fully recognized as essential for successful TAVR, the importance of using a heart team approach for TAVR was specified in the Korean guidelines (Appendix 1).

The detailed standards of TAVR implementation in Japan and the United States are as follows:

1) Qualifications to begin a TAVR program in the United States [2]

(1) ≥50 total aortic valve replacements (AVRs) in the previous year prior to TAVR, including ≥10 high-risk patients

(2) ≥2 physicians with cardiac surgery privileges

(3) ≥1,000 catheterizations per year, including ≥400 percutaneous coronary interventions (PCIs) per year

2) Qualifications to begin a TAVR program in Japan [4]

(1) ≥20 AVRs per year

(2) ≥3 Cardiac surgeons

(3) ≥100 PCIs per year

(4) ≥10 Aortic stent grafts per year

(5) ≥200 Instances of transesophageal echocardiography

However, in contrast to these strict conditions, the prerequisite criteria for the institutional initiation and continuation of a TAVR program in Korea are considerably laxer (Appendix 1).

In terms of the role of heart team, the Korean guidelines, approved by all members of the advisory committee, also eased the regulatory requirements for institutional TAVR application to include even cases that would otherwise be deemed controversial and possibly contraindicated for TAVR according to published international guidelines. However, as a safeguard, the administrative decree on the practice of TAVR in Korea specified that the heart team in each hospital should faithfully submit any and all reasons for not strictly abiding by the set indications for TAVR for monitoring purposes.

At the outset, it was agreed that only 20% of the medical expenditures relating to the device fee would be reimbursed by the national medical insurance system starting in June 2015. It was also decided that any amendments to this proportion would only be made after the final assessment of the mandatory monitoring outcomes in 2018. Thus far, despite succinct publication of the official guidelines and the administrative decree for TAVR, several factors have hindered the monitoring process. TAVR monitoring meetings were held only twice during the past 2 years (from June 2015 to May 2017). This was further compounded by poor data preparation, which significantly hindered any meaningful discussions during the monitoring meetings (Tables 1, 2).

With an international platform provided by the annual meeting of the Asian Society of Cardiovascular and Thoracic Surgery in late March 2017, the KTCVS was able to share the current status of TAVR in Korea and to hold discussions with international colleagues on overcoming obstacles relating to establishing nationwide TAVR practices. During this meeting, discussions were also held with Asian and Western colleagues on the role of cardiac surgeons in the heart team. The discussions showed that in most nations with well-established nationwide TAVR programs, TAVR was implemented by following clearly defined protocols accompanied by an accurate analysis of monitoring data on outcomes. We also discussed ways to overcome the difficulties relating to TAVR monitoring with government officials and parliamentary members. We informed them of the importance of monitoring TAVR procedures, and presented arguments supporting the importance of accurate monitoring for ensuring the safety and efficacy of TAVR implementation. Thus, the meeting held on July 4, 2017 was concluded by all members of the advisory committee agreeing to concentrate future efforts to ensure complete and faithful data collection

and objective statistical data analysis through outsourcing to a third party, as well as to hold regular TAVR monitoring meetings.

In 2017, the ACC suggested an expert consensus decision pathway for TAVR in the management of aortic stenosis [7]. They stated that patient management relies on a shared decision-making approach based on a comprehensive understanding of the risk-benefit ratio of different treatment strategies and integration of patient preferences and values. In addition, the heart valve team should emphasize that the purpose of valvular intervention is to improve symptoms and/or to prolong survival, while minimizing adverse outcomes associated with the intervention [8]. We cannot avoid all the possible complications of TAVR, despite a strongly collaborative heart team, as urgently occurring adverse events are not completely predictable or preventable. Nevertheless, data collection as part of an accurate monitoring process will provide valuable information that will minimize the risk of such complications and ultimately make the implementation of TAVR safer and more effective.

Finally, quality assessment of the entire spectrum of the medical landscape is of paramount import, and TAVR quality metrics are important for assessing the appropriateness of TAVR in an objective and widely applicable manner. The 2 fundamental components determining the quality of health care at TAVR centers of excellence are the use of a heart team and the active participation and management of a registry program [8]. Maintaining a well-run registry is essential for tracking and monitoring adverse events, prevents missed follow-up evaluations, and allows institutions to implement necessary measures or treatment in a timely manner, thereby preventing the occurrence of more serious adverse events. Objective analysis and retrospective reflection upon past practices allow revisions of current limitations to be implemented where necessary and lead to optimal stepwise improvements in patient care based on past experiences. Patient safety should be the top priority in any TAVR program, above all other considerations. To ensure the optimal implementation of the system, the will of the government is also important. To this end, maintaining a program of prospective monitoring is of paramount importance.

Conclusion

Compliance with TAVR guidelines is essential for ensuring efficacy and safety in treating high-risk or inoperable patients with severe aortic stenosis. Moreover, the TAVR monitoring process should be appropriately conducted to ensure accurate evaluation of all aspects of activities relating to TAVR, as well as the directly related outcomes. Although each country has unique circumstances, those planning to initiate TAVR will inevitably encounter various difficulties relating to the initiation and subsequent monitoring of TAVR. However, continued efforts should be made to persuade members of the relevant governmental institutions and professional societies to take steps promoting the seamless application of TAVR.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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