EDITORIAL

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Using big data to see the forest and the trees: endoscopic submucosal dissection of early gastric cancer in Korea

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Gastric cancer is the third most common cause of cancer-related deaths worldwide, presenting a global health-related burden [1]. Korea, which has the highest incidence of gastric cancer of any country, adopted the National Cancer Screening Program in 1999 [2]. With the widespread implementation of this endoscopic screening program, the proportion of patients diagnosed with early gastric cancers (EGCs) at the time of screening has increased [2,3]. Although previous nested case–control studies conducted in Korea showed that endoscopic screening programs have reduced gastric cancer mortality rates by 42% to 47% [2,4], these results would not have been possible without excellent therapeutic outcomes of EGCs.

Endoscopic submucosal dissection (ESD) is the established treatment for superficial gastrointestinal neoplasms with minimal risk of lymph node metastasis. The most important advantage of this procedure is its ability to achieve curative resection with minimal invasiveness, avoiding surgery that is inevitably accompanied by substantial morbidity [5]. ESD has emerged and evolved via improvements in skill, expertise, and equipment, to arrive at a better understanding of indications, short- and long-term outcomes, and management of complications.

In the latest issue of *The Korean Journal of Internal Medicine*, Kim et al. [6] evaluated the current clinical status of ESD for EGCs in Korea based on raw data from the Health Insurance Review and Assessment Service (HIRA) database, collected between 2011 and 2014. A total of 23,828 cases of EGC treated with ESD were assessed. Approximately two-thirds of these ESD procedures were conducted in tertiary care hospitals and one-third in general hospitals. The therapeutic outcome was excellent, with a 99% *en bloc* resection rate that did not change according to the year or type of hospital [6].

Few analyses of ESD using National Health Insurance Service (NHIS) claims data have been conducted due to the nature of the database itself; these claims data have been collected for the purpose of reimbursing healthcare services, not for research [7]. The most important limitation of these data is the accuracy of diagnosis. The possibilities of coding error or of up-coding by providers for higher reimbursement rates should be considered in any analysis of claims data [7]. Therefore, implementation of an operational definition algorithm combining various types of

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information in the database, along with validation using data from real clinical settings, has been recommended to accurately identify patients with a certain disease rather than simply applying diagnostic codes [7]. In the study by Kim et al. [6], patients with code C16 according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10), were considered to have a diagnosis of gastric cancer. Considering that the coding of severe diseases tends to be more accurate than that of mild diseases in claims data [7], use of the IDC-10 C16 code likely enabled the researchers to identify nearly all gastric cancer patients who visited the hospital during the study period. Moreover, combining a search of procedural and material codes with that of ICD codes further reduced the diagnostic error in that study.

In terms of the therapeutic outcomes of ESD, it may be useful to compare the results of Kim et al.'s study [6] with those of representative Korean studies, as validation was not performed in their study. Chung et al. [8] evaluated 1,000 cases of EGCs from six university hospitals, enrolled during 2006 to 2007, and showed a 95.3% *en bloc* resection rate. However, that study was a retrospective analysis and was conducted earlier than that of Kim et al. [6]. Another previous Korean study found that the *en bloc* resection rate during 2005 to 2009 was 80.5%, whereas that during 2009 to 2015 was 89.1%, indicating an improvement over time [9]. A recent prospective multicenter cohort study enrolled 697 patients from 12 nationwide hospitals during 2010 to 2011 and showed a 99.1% *en bloc* resection rate irrespective of indications [10], suggesting that the results of the study by Kim et al. [6] are representative of therapeutic outcomes in real clinical practice.

Another study, by Byeon and Kim [11], evaluated pathologic issues relevant to ESD using national patient sample data from the HIRA. In addition to raw data, the HIRA also presents reliable and representative sample datasets by extracting samples stratified by age and sex [7]. These sample datasets were also tested for validation. The study by Byeon and Kim [11] included 509 ESD cases in 490 patients from 2013. In addition to patients with the C16 code, 56.5% of the registered patients had a D code, 10.5% of whom were up-coded after ESD [11]. Gastrectomy following ESD was performed in 4.3% of the patients, with a mean time between ESD and surgery of 44 days [11]. In the study by Kim et al. [6], 8.5% of patients underwent additional treatment within 90 days of ESD (6.6% underwent surgery and 1.9% endoscopic treatment), whereas 5.5% underwent additional treatment between 91 and 365 days after ESD (4.4% underwent endoscopic treatment, 1.0% underwent surgical treatment, and 0.1% underwent both) [6]. Additional treatment after ESD appears to be needed in approximately 4.4% to 8.5% of patients, although the exact curative resection or recurrence rate could not be measured in that study.

Another study using the NHIS national sample cohort (NHIS-NSC) enrolled 1,671 patients with carcinoma in situ of stomach or gastric cancer during 2002 to 2013 [12]. That study showed that the lowest-income patient group received a lower rate of endoscopic treatment than the highest-income group, indicating that although endoscopic treatment for EGC has been covered by the NHIS since 2011, there is still a need for better detection of eligible early-stage cancers and treatment in patients of low socioeconomic status [12]. The study by Kim et al. [6] showed that the median total medical cost per patient was approximately 1,300 US dollars (USD) in 2011, 1,400 USD in 2012 and 2013, and 1,500 USD in 2014, and these costs did not differ between tertiary care and general hospitals.

The results of studies conducted at a single institution or involving a small number of participants are hard to generalize beyond the study's particular population. However, analysis of claims data has the advantage of tracking patients by their medical activity or mortality in the same database, even when they visit a second or third medical facility, enabling analysis of a more complete dataset [11]. However, as stated above, the limitations of claims data due to the nature of the database limit its widespread application in medical research. In this study, two operational definitions were made. The first was the definition of absolute indications. In 2011, the HIRA began to cover gastric ESD with co-payment coverage for cases meeting absolute indications, so that study defined cases with absolute indications as those in which ESD was covered by the HIRA [6]. The second definition was that of *en bloc* resection by ESD. Cases were considered to have achieved *en bloc* resection if ESD codes were charged without endoscopic mucosal resection (EMR) codes. If a case was charged with EMR codes and material codes of ESD simultaneously, it was

defined as piecemeal resection. Some cases were classified as unknown if they were charged with ESD and EMR codes simultaneously [6]. Although that study did not perform validation of these operational definitions, it should be noted that the best way to see the big data is as it is. However, it is difficult to extrapolate clinical practices from reimbursement data.

There are still unresolved questions relevant to ESD for EGCs, such as whether expanded indications of ESD for EGC should be adopted as a standard treatment, or whether separate indications are needed according to the type of EGC with undifferentiated-type histology (poorly differentiated tubular vs. poorly cohesive [including signet-ring cell] carcinoma) or EGCs with mixed-type histology [13]. However, it is difficult to answer these questions using the current claims data analyses.

In brief, analysis of HIRA data seems to enable seeing the forest for the trees. However, researchers still want to see both the forest and the trees.

Conflict of interest

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

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