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# The DICA Endoscopic Classification for Diverticular Disease of the Colon Shows a Significant Interobserver Agreement among Community Endoscopists: an International Study

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## ABSTRACT

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**Background & Aims:** The Diverticular Inflammation and Complication Assessment (DICA) endoscopic classification of diverticulosis and diverticular disease (DD) is currently available. It scores severity of the disease as DICA 1, DICA 2 and DICA 3. Our aim was to assess the agreement on this classification in an international endoscopists community setting.

**Methods:** A total of 96 doctors (82.9% endoscopists) independently scored a set of DD endoscopic videos. The percentages of overall agreement on DICA score and a free-marginal multirater kappa ( $\kappa$ ) coefficient were reported as statistical measures of interrater agreement.

**Results:** Overall agreement in using DICA was 91.8% with a free-marginal kappa of 88% (95% CI 80-95). The overall agreement levels were: DICA 1, 85.2%; DICA 2, 96.5%; DICA 3, 99.5%. The free marginal  $\kappa$  was: DICA 1 = 0.753, DICA 2 = 0.958, DICA 3 = 0.919. The agreement about the main endoscopic items was 83.4% ( $\kappa$  67%) for diverticular extension, 62.6% ( $\kappa$  65%) for number of diverticula for each district, 86.8% ( $\kappa$  82%) for presence of inflammation, and 98.5 ( $\kappa$  98%) for presence of complications.

**Conclusions:** The overall interrater agreement in this study ranges from good to very good. DICA score is a simple and reproducible endoscopic scoring system for diverticulosis and DD.

**Key words:** agreement – colonoscopy – community setting – diverticular disease of the colon– endoscopic classification.

**Abbreviations:** AD: acute diverticulitis; CT: computer tomography; DD: diverticular disease; DICA: Diverticula Inflammation and Complications Assessment; SCAD: segmental colitis associated with diverticulosis.

## INTRODUCTION

The most frequent anatomic alteration detected during colonoscopy is the colonic diverticulosis [1]. The prevalence of diverticulosis increases with age. However, it remains generally asymptomatic, and only about 20-25% of those people may develop symptoms that can be linked to diverticulosis, developing the so-called “Diverticular Disease” (DD) [2]. As many diseases, DD may be scored in several ways. Imaging classifications, assessing particularly the appearance of the disease by abdominal computer tomography (CT), are the most used [3-5]. Other classifications focused their attention on the clinical appearance of the disease, trying to identify patients with different risks of severity [6-8]. However, most of them focused their attention on the severity of the acute diverticulitis (AD) rather than on the overall spectrum of the disease.

Although the large number of colonoscopies currently performed in real life, and the frequent detection of endoscopic signs of diverticular inflammation in patients submitted to colonoscopy [9, 10], an endoscopic classification of the disease was lacking until 2015. In that year, the first endoscopic classification of DD, called “DICA” (Diverticula Inflammation and Complications Assessment), has been developed and validated [11]. This classification takes into consideration several scored items (extension of diverticulosis, number of diverticula for each district, presence of inflammatory signs and occurrence of complications) and the relative sub-items, the sum of them leading to three different DICA scores (DICA 1, DICA 2, and DICA 3). The importance of this classification is linked to its predictive value. An international, retrospective study recently found this classification effective in predicting the course of the disease in terms of AD occurrence/recurrence and surgery occurrence [12], and the preliminary data from a prospective study seem to confirm the prior results [13].

Some criticisms have been raised because this classification has been developed and validated by expert endoscopists. However, a recent study conducted in Italy found a significant interobserver agreement also in real life [14]. The aim of the present study was to assess the agreement about DICA classification involving a large community of physicians coming from several countries.

## METHODS

The reproducibility level of the DICA endoscopic classification was evaluated in an interobserver variation study conducted during the 33d International Symposium on Diverticular Disease, held in Madrid on April 11-13, 2019.

In order to select the videos, the promoters of DICA classification (A. Tursi, G. Brandimarte and F. Di Mario) retrospectively reviewed 100 videos coming from their centers and showing colonic diverticular disease. All videos were completely anonymous, and all patients gave written informed consent before undergoing colonoscopy. Among them, 10 videos were randomly selected according to complete endoscopic exploration of the colon and showed to the audience for the scoring.

All videos were classified according to DICA classification [11], considering the following items and sub-items:

- a. **Diverticulosis extension:** left colon (up to splenic flexure); right colon (over the splenic flexure).
- b. **Number of diverticula** (in each district): up to 15: grade I; >15: grade II).
- c. **Presence of inflammation:** Edema/Hyperemia; Erosions; Segmental colitis Associated with Diverticulosis (SCAD). When different grades of inflammation were detected at the same time and in the same district (in example, some diverticula showing hyperemia and some showing erosions), the most severe grade of inflammation was reported.
- d. **Presence of complications:**
  - *Rigidity of the colon:* scarce distension of the diverticular district to inflation, including mild stenosis in which the standard colonoscope could be passed through the narrowed lumen;
  - *Stenosis:* not passing stenosis or narrowed lumen with elevated risk of perforation due to presence of some anatomical characteristics (in example, multiple diverticula at the splenic flexure);
  - *Pus:* purulent material coming out from diverticular opening.
  - *Bleeding.*

Videos were classified by A. Tursi and G. Brandimarte. Conflicting classification was resolved by a third part (F. Di Mario).

Visualization of the videos and assessment of the endoscopic variables under examination were performed during a plenary session lasting four hours. Participants had ten minutes to assess and rate each video, and scoring was made by using an anonymous chart collection. At the end of the session, a discussion of the results was performed. The promoters of the study took part into discussion but did not interfere with the decisions of the group.

All participants to the Post-Graduated course on DICA classification, held during the 3rd International Symposium on Diverticular Disease of the colon, scored the videos in order to assess the reproducibility of DICA classification in an international clinical setting. Not all the participants involved were endoscopists or knew the DICA classification, and not all of them used it in their practice. Thus, we assessed if they were endoscopists or not, if they had knowledge or not about DICA classification, and if they used it in their practice.

### Statistical analysis

Agreement between evaluations of endoscopic findings was assessed through kappa statistics (a coefficient of interobserver agreement over and above the agreement that would be expected to occur by chance alone). Kappa values in percentage range from negative (disagreement) to 100 (total agreement); a value of 0% indicates agreement equal to that expected by pure chance; values below 40% are classified as poor agreement, 41-60% as moderate agreement, 61-80% as good agreement, and values above 80% as very good agreement [15]. Randolph's free-marginal multirater kappa was used [16].

## RESULTS

The study group assessing videos consisted of 96 doctors coming from Europe (Bulgaria, Croatia, Germany, Hungary, Italy, Romania, Poland, Portugal, Slovakia, Spain, The Netherlands, Russia), Africa (Tunisia), America (Brazil, Mexico, United States, Venezuela), and Australia. Endoscopists were 63 (82.9%). DICA classification was known by 62 (81.6%) doctors and used routinely by 37 (48.7%) doctors.

As stated, 10 video clips were evaluated and rated by participants (960 visualizations were therefore performed): 4 videos were classified as DICA 1, 4 as DICA 2 and 2 as DICA 3.

The overall agreement level for DICA classification was 91.8% with a free-marginal kappa of 88% (95% CI 80-95). The overall agreement levels were: DICA 1, 85.2%; DICA 2, 96.5%; DICA 3, 99.5%. The free marginal  $\kappa$  was: DICA 1 = 0.753, DICA 2 = 0.958, DICA 3 = 0.919. The agreement about the main endoscopic items was 83.4% ( $\kappa$  67%) for diverticular extension, 62.6% ( $\kappa$  65%) for number of diverticula for each district, 86.8% ( $\kappa$  82%) for presence of inflammation, and 98.5 (98%) for presence of complications.

Agreement with respect to the four main items included in DICA classification are reported in Table I. Globally, percentage of agreement was very good for each item considered: 83.4% ( $\kappa$  67%) for diverticular extension, 62.6% ( $\kappa$  65%) for number of diverticula for each district, 86.8% ( $\kappa$  82%) for presence of inflammation, and 98.5% (98%) for presence of complications.

**Table I.** The percentage of interobserver agreement of endoscopic items in DICA classification

Item	Overall agreement	Free marginal Kappa	95%CI
Diverticula extent	83.4	67	40-93
Number of diverticula	82.6	65	36-95
Presence of inflammation	86.8	82	69-96
Presence of complications	98.5	98	96-100

## DISCUSSION

Diverticulosis and DD is quite common in the Western World, more in the USA than in Europe, and its prevalence increases worldwide, probably due to progressive adoption of western lifestyle [1]. Thus, it has a significant impact on the National Health Systems.

Although DD can be classified according to several radiological and clinical approaches [3-8], the vast majority of them failed to have an adequate validation and cannot be proposed as standard reference. For many years, an endoscopic classification of the disease was lacking. The absence of any such endoscopic classification was even more evident considering the high number of colonoscopies currently performed, and the significant prevalence of diverticular inflammation detected everyday by colonoscopy [9, 10].

The first endoscopic classification of diverticulosis and DD, called DICA, has been recently developed and validated [11, 12]. This classification was the first attempt to overcome definitions that too vaguely describe the colon with diverticulosis (as example, "scattered" or "diffuse" or "severe" diverticulosis). This classification described the four main items that can be detected during an endoscopic exploration of colon harboring diverticulosis (namely diverticulosis extension, number of diverticula in each district, presence or not of inflammation, and presence or absence of complications). Moreover, it leads to a 3-step simple score, which is linked to the outcome of the disease [11, 12].

Some criticisms have been raised because this classification has been developed and validated by expert endoscopists [11]. This choice probably influenced the results of the validation process, in which the interrater agreement was  $\kappa$  0.878 for DICA 1,  $\kappa$  0.765 for DICA 2, and  $\kappa$  0.891 for DICA 3 [11].

In a recent study conducted among Italian endoscopists community, we tried to overcome this limit [14]. Since DICA classification is not used by all endoscopists, we involved two types of population, namely endoscopists experts and endoscopists not experts with using this classification. We found a good inter-rater agreement in using this classification: the free marginal  $\kappa$  ranged for moderate to good and, as expected, it was higher among endoscopists experts with DICA classification (the free marginal  $\kappa$  ranged from good to very good) [14]. This is a significant result, because agreement in using endoscopic classifications is not always satisfactory even in expert endoscopists. For example, the Savary-Miller scoring system for esophagitis revealed moderate agreement for the experienced group while the Los Angeles system shows a slight improvement but irrespective of the level of experience



[17]. Considering the inflammatory bowel diseases scoring systems, the results were similar. A recent study found that agreement between experienced endoscopists was suboptimal for Mayo subscore, fair for Rutgeerts score, and good for Crohn's Endoscopic Index of Severity and Simple Endoscopic Score for Crohn's Disease scores [18]. But the most important strength coming from that study was that we defined as "expert" physicians who used DICA classification at least three months in his/her practice: this means that the learning curve to obtain expertise about this classification is very short.

The present study, conducted involving participants to the Post-Graduated course on DICA classification, held during the 3rd International Symposium on Diverticular Disease of the Colon, confirms the DICA classification is easy to learn and to use in real life. We found that the agreement for DICA classification was excellent, since the free marginal  $\kappa$  for the overall classification was 88%. This excellent result could be a consequence of the high rate of DICA knowers and users among the raters. On the other hand, we have to consider that this International Meeting was monothematic, and probably has attracted doctors with specific interest in this disease (DICA classification included).

Moreover, the strength of this study is that an international audience was involved for the first time in this process of agreement, while the previous real-life study was conducted in Italy (where the classification was developed and firstly validated).

## CONCLUSION

This international study has confirmed once again that DICA classification is a reproducible and easy-to-use endoscopic scoring system for diverticulosis and DD of the colon.

## APPENDIX

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