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The "DICA" Endoscopic Classification for Diverticular Disease of the Colon Shows a Significant Interobserver Agreement among Community Endoscopists

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ABSTRACT

Background & Aim: An endoscopic classification of Diverticular Disease (DD), called DICA (Diverticular Inflammation and Complication Assessment) is currently available. It scores severity of the disease as DICA 1, DICA 2 and DICA 3. Our aim was to assess the agreement levels for this classification among an endoscopist community setting.

Methods: A total of 66 endoscopists independently scored a set of DD endoscopic videos. The percentages of overall agreement on the DICA score and a free-marginal multirater kappa (κ) coefficient were reported as statistical measures of the inter-rater agreement.

Results: The overall agreement levels were: 70.2% for DICA 1, 70.5% for DICA 2, 81.3% for DICA 3. The free marginal κ was: 0.553 for DICA 1, 0.558 for DICA 2, 0.719 for DICA 3. The agreement levels among the expert group were: 78.8% for DICA 1, 80.2% for DICA 2, 88.5% for DICA 3. The free marginal κ among the expert group were: 0.682 for DICA 1, 0.712 for DICA 2, 0.828 for DICA 3. The agreement of expert raters on the single item of the DICA classification was superior to the agreement of the overall group.

Conclusions: The overall inter-rater agreement for DICA score in this study ranges from moderate to good, with a significant improvement in the expert subgroup of raters. Diverticular Inflammation and Complication Assessment is a simple and reproducible endoscopic scoring system.

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

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

INTRODUCTION

Diverticulosis of the colon is the most frequent anatomic alteration that endoscopists detect during colonoscopy in clinical practice [1]. Although diverticulosis prevalence increases with age, it remains generally asymptomatic, and only about one fifth of the patients may have symptoms occurrence called "Diverticular Disease" (DD) [2].

Diverticular Disease may be scored according to imaging classifications, particularly the computer tomography (CT) appearance of the disease being the most used [3-5]. Other classifications focused on the clinical appearance of the disease, in order to identify patients at risk of severe forms [6-8]. However, most of them concentrated on the severity of acute diverticulitis, rather than on the overall spectrum of the disease.

An endoscopic classification of the disease was lacking until 2015, in spite of the large number of colonoscopies currently performed and the significant incidence of endoscopic signs of diverticular inflammation in patients submitted to colonoscopy [9, 10]. In 2015, the first endoscopic classification of diverticular disease, called "DICA" (Diverticula Inflammation and Complications Assessment) was 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). An international, retrospective study recently found this classification effective in predicting the course of the disease in terms of acute diverticulitis occurrence/recurrence and surgery occurrence [12].

However, this classification was developed and validated by expert endoscopists. The aim of the present study was to reassess the DICA classification involving a large community of endoscopists, both expert and non-expert.

METHODS

The reproducibility level of the DICA endoscopic classification was evaluated in an interobserver variation study.

In order to select the videos, the promoters of DICA classification (A.T., G.B. and F.M.) retrospectively reviewed 100 videos from their centers, showing colonic DD. All videos were completely anonymous, and all patients gave written informed consent before undergoing colonoscopy. Among them, 20 videos were randomly selected according to the complete endoscopic exploration of the colon.

All videos were classified according to DICA classification, considering the following items and sub-items (Table I):

a. diverticulosis extension: left colon (up to splenic flexure); right colon (over then 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 severity of inflammation was detected at the same time and in the same district (for example, some diverticula evidencing hyperemia and some evidencing 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 the diverticular opening;

bleeding.

Videos were classified by A.T. and G.B.. Conflicting classification was resolved by a third part (F. di M.).

The promoters selected a panel of endoscopists from university hospitals, first level, secondary and tertiary hospitals, and from territorial endoscopic centres. The reason of this modality of endoscopist selection was that the end-point of this study was to assess the reproducibility of DICA classification in a clinical setting. All the endoscopists involved knew the DICA classification, but not all of them used it in their practice. Thus, they were subdivided as expert (31 endoscopists), namely using DICA classification in their practice for at least three months prior to the plenary session, and non-expert (35 endoscopists), namely not using DICA classification in their practice.

Visualization of the videos and assessment of the endoscopic variables under examination were performed during a plenary session lasting two days by the members of the group. Each participant assessed the videos using their own tablet, had ten minutes to evaluate and rate each video, and their response was anonymously collected via electronic data collection. At the end of the second day, a discussion of the results was performed. The promoters of the study took part

Table I. Items assessed in constructing DICA classification.

Diverticulosis extension:	Left colon		Right colon	
Number of diverticula in each district:	Grade I: ≤ 15 diverticula		Grade II: >15 diverticula	
Inflammation:	Absence of signs of inflammation	Edema/hyperemia	Erosions	SCAD
Complications:	Rigidity	Stenosis	Pus	Bleeding

Items	**Points**
Diverticulosis extension	
left colon	2
right colon	1
Number of diverticula (in each district)	
up to 15: grade I	0
>15: grade II	1
Presence of inflammatory signs	
Edema/Hyperemia	1
Erosions	2
SCAD	3
Presence of complications	
Rigidity of the colon	4
Stenosis	4
Pus	4
Bleeding	4
Total:	….

DICA Classification Numerical value	
DICA 1	From 1 to 3 points
DICA 2	From 4 to 7 points
DICA 3	> 7 points

DICA: Diverticula Inflammation and Complications Assessment; SCAD: Segmental Colitis Associated with Diverticulosis.

Table II. Results of the classification interrater agreement

Raters	DICA 1		DICA 2		DICA 3	
	Overall agreement	Free marginal Kappa	Overall agreement	Free marginal Kappa	Overall agreement	Free marginal Kappa Experts
	0.788	0.682	0.802	0.712	0.885	0.828
Total	0.702	0.553	0.705	0.558	0.813	0.719

into discussion, but did not interfere with the decisions of the group. For this type of study formal consent is not required.

Statistical analysis

The percentages of overall agreement on the DICA score and the inter-rater agreement was assessed through a free-marginal multirater kappa (κ) coefficient (a coefficient of interobserver agreement over and above the agreement that would be expected to occur by chance alone). A value of 0 indicates agreement equal to that expected by pure chance; values below 0.4 are classified as poor agreement, 0.41 to 0.60 as moderate agreement, 0.61 to 0.80 as good agreement and values above 0.80 as very good agreement [13, 14].

Data were analyzed with statistical software SPSS for Windows, version 11.0, SPSS Inc., Chicago, Ill.

RESULTS

Overall, 20 video clips were evaluated and rated by 66 endoscopists. Seven videos were classified as DICA 1, seven as DICA 2 and six as DICA 3. The overall agreement levels among the total group of raters were as follows: 70.2% for DICA 1; 70.5% for DICA 2; 81.3% for DICA 3. The free marginal κ varied as follows: 0.553 for DICA 1, 0.558 for DICA 2, 0.719 for DICA 3. The overall agreement levels among the expert group of raters were as follows: 78.8% for DICA 1; 80.2% for DICA 2; 88.5% for DICA 3. The free marginal κ varied as follows: 0.682 for DICA 1, 0.712 for DICA 2, 0.828 for DICA 3 (Table II).

The agreement of expert raters on the single items of the DICA classification was superior to the agreement of the overall group (Table III).

Table III. Results of interrater agreement with the classification items.

Items	Experts	Total
Diverticulosis extension		
Overall agreement	0.787	0.746
Free marginal kappa	0.680	0.619
Number of diverticula		
Overall agreement	0.769	0.773
Free marginal kappa	0.539	0.546
Presence of inflammation		
Overall agreement	0.609	0.578
Free marginal kappa	0.479	0.437
Complications		
Overall agreement	0.797	0.777
Free marginal kappa	0.747	0.721

DISCUSSION

Diverticular disease has a significant impact on Health Systems. It is quite common in the Western World, more in the USA than in Europe, being less frequent in Africa and Asia. However, its prevalence seems to be increasing worldwide, probably due to the progressive adopting of a western lifestyle [1]. Diverticular disease can be currently classified according to several radiological and clinical approaches [3-8].

However, the vast majority of them fail to have an adequate validation, and cannot be proposed as a standard reference. While clinical and radiological classifications were available, 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 frequently by colonoscopy [9, 10].

In 2015, we presented the first validated endoscopic classification of DD, called DICA [11, 12]. This classification was the first attempt to overcome definitions that describe the colon with diverticulosis too vaguely (as example, "scattered" of "diffuse" or "severe" diverticulosis). This classification described the four main items that can be detected during an endoscopic exploration of colon harboring diverticulosis (see Table I). Moreover, it leads to a three-step simple score, which is linked to the outcome of the disease [11, 12].

During the development and validation process, we involved 32 expert endoscopists [11]. This choice probably influenced the results of the validation process, in which the inter-rater agreement k were 0.878 for DICA 1, 0.765 for DICA 2, and 0.891for DICA 3 [11].

In the present study, we analyzed the agreement levels for this classification in an endoscopist community setting, where DICA was not used by all endoscopists. In this way, we involved two types of endoscopists: experts and non-experts for using this classification. We found a good inter-rater agreement in using this classification. As expected, the inter-rater agreement was superior among endoscopists expert in DICA classification. This is a significant result, because agreement in using endoscopic classifications is not always satisfactory even by expert endoscopists. For example, the Savary-Miller scoring system for esophagitis revealed moderate agreement for the experienced group while the agreement level for Los Angeles system showed a slight improvement, but irrespective of the level of experience [15]. Considering the inflammatory bowel diseases scoring systems, a recent study found that agreement between experienced endoscopists for Crohn's Disease scores was

suboptimal for the Mayo subscore, fair for Rutgeerts score, and good for Crohn's Endoscopic Index of Severity and Simple Endoscopic Score [16].

Another strength of this study is that an adequate agreement was also found between non-experts for DICA classification. This agreement is not easy to reach when using a clinical classification. For example, the Savary-Miller scoring system for esophagitis revealed poor agreement when applied by inexperienced raters [16], and only a dedicated training program could significantly affect inter-rater agreement among non-expert endoscopists, when scoring inflammatory bowel diseases [17].

An adequate agreement obtained among endoscopists non-expert in DICA classification supports the evidence that DICA classification is simple, and easy to use even at the beginning of its use in real life.

We also assessed the agreement for the four items of DICA. We found that a good agreement was obtained for each of the four main items except for the detection of inflammation, that reached an inferior, although acceptable, agreement. This was particularly true for the non-expert endoscopists. It is therefore probably that a short training may improve the agreement also among non-expert endoscopists.

Finally, a further strength of this study is the large number of endoscopists involved. Since we know that agreement is inversely linked to the number of participants and visualization, the final agreement linked to a large number of visualizations strengthens the efficacy of this classification.

The limit of this study could be the absence of an intra-observer analysis. This analysis is generally performed after a variable period of time in order to assess the agreement of the same rater in assessing the same videos. However, we did not perform the intra-observer analysis because no repeated evaluation of a single observer was scheduled in this study.

CONCLUSIONS

This study showed that DICA classification was a reproducible and easy-to-use endoscopic scoring system for DD of the colon. The inter-rater agreement among a community of endoscopists was adequate, irrespective of their experience. Since a significant improvement of the agreement in the expert subgroup of raters was recorded, a brief training on this classification might improve its reproducibility.

Conflicts of interest: C.S. has served as a speaker and advisory board member for Alfa Wassermann. F. di M. has served as a speaker and advisory board member for SOFAR Farmaceutici SpA. The other authors have no conflicts of interest to declare.

Authors' contributions: Conception and design of the study: A.T., G.B., F.M. Acquisition of data, or analysis and interpretation of data: A.T., G.B., F. di M., G.N., W.E., M.P., C.S., and all the members of DICA Italian Group. Drafting the work or revising it critically for important intellectual content: A.T., W.E., M.P. Final approval of the version to be submitted: A.T., G.B., F. di M., G.N., W.E., M.P., C.S., and all the members of DICA Italian Group.

APPENDIX

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