The new educational project Televascular Games during the Coronavirus Disease 2019 pandemic

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ABSTRACT

Objective: To report methodology and first-year results of a new educational project called Televascular Games," which took place during coronavirus disease 2019 pandemic.

Methods: Complex aneurysmal aortic disease was discussed during a 2-hour competition webinar, according to three modalities. (1) Planning case competition (PCC): Two to four preoperative computed tomography angiography (CTA) scans of an already performed selected case were submitted for the competition. CTA scans were uploaded anonymously, without any reference to the center or the surgeon who performed the case. The competitor had to prepare a presentation of how he or she would have diagnosed, sized, planned, treated, and followed up the case, of the medical therapy and of the bail-out maneuvers. (2) Challenging case competition (CCC): The competitor elaborates a presentation of an already treated case concerning an aortic topic and discusses sizing, planning, treatment, possible bail-out maneuvers and obtained results. For the CCC and PCC, the competitors with the best score were preselected to present and discuss their plan during the webinars. (3) Quiz competition: Two to six CTA scans of already performed selected aortic cases were submitted for the competition. A quiz with multiple choice questions was answered by the competitors. The top four competitors were selected for the webinars and then they discussed the cases during the webinar. Finally, at the end of the case discussion, the effective case resolution and follow-up were shown. A final winner was voted via televoting, based on six preestablished criteria. The project was endorsed by different national and international societies.

Results: Between October 2020 and December 2021, there were 12 Italian and 1 international webinars with 1695 participants overall (mean, 130; range, 86-177). Competitors were 54 years of age (mean, 27 years; range, 22-38 years). Two editions were CCCs, two quiz competitions, and nine PCCs. The reliability of the interobserver sizing of competitors was $\kappa = 0.43$ and $\kappa = 0.62$ for the proximal and distal sealing measurements respectively and very good ($\kappa = 0.88$-0.95) in the evaluation of orientation of the vessels, presence of angulations, calcifications, and thrombus. The sizing discrepancy resulted in a significant variability of the planning ($\kappa = 0.45$). The project ranked 9.6 on a 10-point rating scale by all the participants and competitors.

Conclusions: The formula of gaming and collegial discussion of aortic cases herein reported has proved valid and attractive during coronavirus disease 2019 pandemic period. The variability of the results on sizing and planning suggested to confer with a second opinion, especially for less experienced surgeons. (J Vasc Surg Cases Innov Tech 2022;8:638-45.)

Keywords: Telemedicine; Telehealth; Teleconsultation; Education; Training; Thoraco-abdominal aortic disease; Aneurysm; Aortic dissection

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The sizing, planning, and treatment of complex aortic disease, such as thoracoabdominal aortic aneurysm, pararenal aneurysms, aortic arch aneurysms, or type B aortic dissections, can be a challenging activity for a vascular surgeon.[1-5] The rapid evolution of scientific and technical knowledge with the surgeons' demand for an easy and full access to high-quality information is an important issue as well. Medical education in 2020 and 2021 was struck by the coronavirus disease 2019 (COVID-19) pandemic and the possibility to attend meetings, to visit leading centers and operative theatres, or for in-person discussion of complex cases, was unfortunately impossible or very limited. Alternatives had to be created to continue training and education. Tele-meetings and online conferences have boomed.[6] Our goal was to create an educational online project, capable of building a culture of sharing and collaborating on cases between professionals, giving young surgeons the possibility to participate, discuss, and deepen their knowledge.[7,8] To increase participation in such an event, a game system was created to encourage interaction, sharing, and ideas. The gaming system is a stimulus for the attention of all participants and makes their involvement constant and productive.

The aim of this article was to report the methodology and first-year results of a new educational project called Televascular Games, which took place during COVID-19 pandemic.

METHODS

In the summer of 2020, the idea of creating a new educational project started. The first Italy's COVID-19 wave had just ended, after a very tight lockdown.[9] Scientific meetings and other social and educational events were stopped completely. We wanted to create a safe, educational, and interesting event. First, the safety: A second wave was expected in autumn and any event could not be with physical presence. Second, there were plenty of online events and webinars, and we aimed to create something different from the standard webinar modality. Third, we asked ourselves: How can we stimulate participation and discussion? A gaming and winning mechanism was thought to be capable of attracting surgeons, making the event educational and interesting at the same time. The topics of the meetings were different: thoracoabdominal, pararenal, iliac and arch aneurysms, type B dissections, and endovascular aortic repair (EVAR) in a short and angulated neck.

The national edition of the Televascular Games included 12 events for a total of 36 Italian Continuing Medical Education (CME) credits (accredited by the Italian Ministry of Health). An international appointment was also held in June 2021, obtaining 2 CME credits (accredited by the European Accreditation Council for Continuing Medical Education)

The Webinar was built in two parts

- Competitors, discussants, and moderators were on a traditional Zoom (San Jose, CA) meeting.
- Learners and spectators were on a streaming platform, where they watched the live with a maximum of a 5-second delay. They had the possibility to chat live, respond to instant polls and televoting (Fig 1).

On the Zoom platform, competitors can share the screen to present their case. Speakers and jurors can interact live to ask questions on the case. The Televascular Games platform was developed using a specific software (www.codeigniter.com/). The frontend was developed with html/css language.

The platform was designed with the following features:

1. The possibility of instant voting and publication of live results
2. An internal chat designed to ask questions of speakers and competitors
3. A real-time televoting system to award the first prize

The televoting is based on an arbitrary algorithm written for the platform capable of weighing the votes of the public (40%) differently from those of the jury (60%). The system allows the users participating in the event to be viewed in real time. The event was designed in three main formulas:

1. Planning case competition (PCC): two to four computed tomography angiography (CTA) scans of a completed, selected case were submitted for the competition. CTA scans were shared anonymously, without any reference to the center or the surgeon who performed the case. Patient's consent was given. The competitor had to prepare a presentation of how he or she would have diagnosed, sized, planned, treated, and followed up the case, of the medical therapy and the bail-out maneuvers. A template on how to prepare a presentation was submitted (Power Point, Microsoft Office, Redmond, WA).
2. Challenging case competition (CCC): The competitor elaborates on the presentation of a completed case at their site on an aortic topic discussing sizing, planning, treatment, possible bail-out maneuvers, and the obtained results. The template on how to prepare a presentation was the same used for the PCC.
3. Quiz competition: Two to six CTA scans from completed selected aortic cases were submitted for the competition. A quiz with multiple choice questions was answered by the competitors.

The competitors were allowed to use different software to reconstruct the CTAs. The DICOM files were reconstructed by the competitor using the software of choice which included Aquarius (TeraRecon, San Mateo, CA), OsiriX or Horos (Pixmeo, Geneva, Switzerland), 3mensio (Pie Medical Imaging, Maastricht, the Netherlands), or RadiAnt workstations (Medixant, Poznan, Poland). Multiplanar, three-dimensional, centerline reconstructions of

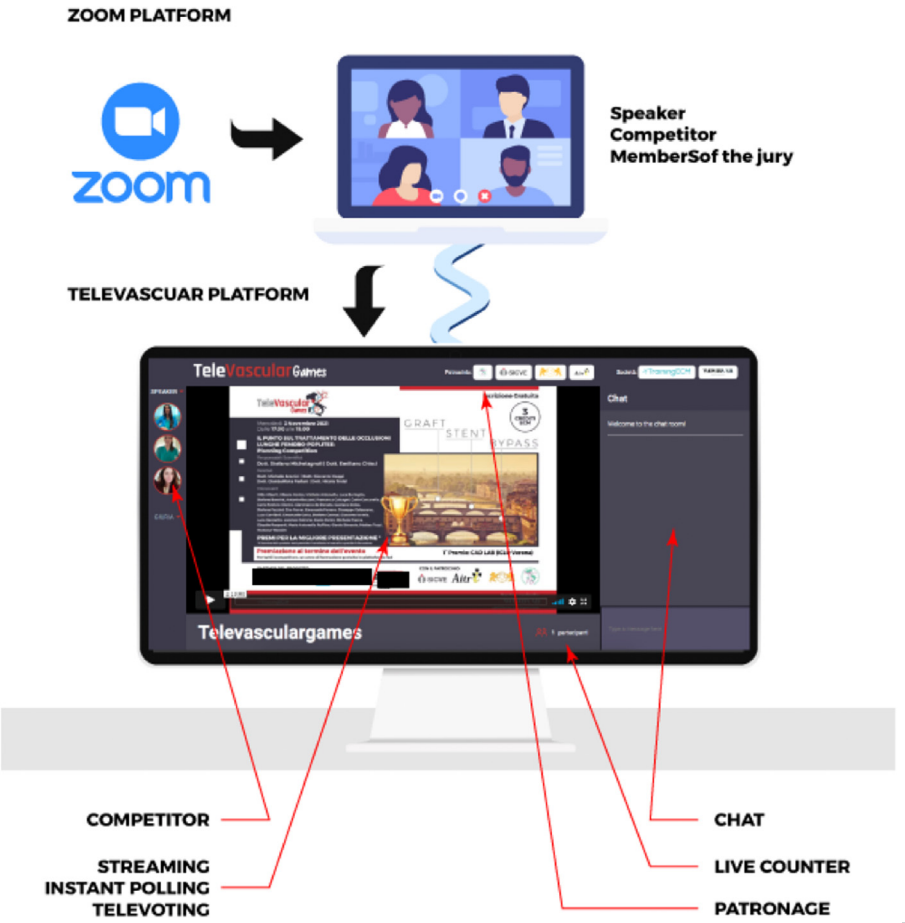

Fig 1. Scheme of how the Televascular event takes place simultaneously on the two streaming platforms. The ZOOM platform (*top*) and the Televascular Games platform (*bottom*).

the case were performed by the submitting competitors. The template required information on proximal and distal neck lengths and diameters and the presence of any target vessel angulation of more than 60°; any significant calcification (circumferential) or thrombus presence (>50%) was measured. The measurements provided by the submitting competitors were compared with ones provided by the surgeons presenting the case, having as baseline these last measures. The calculation of an inter-rater agreement statistic (Kappa; ie, interobserver reliability) was evaluated and the κ value was interpreted according to Altman's criteria.[10] The value of κ strength of agreement was considered poor when less than 0.20, fair when between 0.21 and 0.40, moderate when between 0.41 and 0.60, good when between 0.61 and 0.80, and very good when between 0.81 and 1.00. SPSS version. 15.0 software (SPSS Inc., Chicago, IL) was used for statistical analysis.

The four competitors with the best score were selected anonymously to present and discuss during the webinars. Part of the Faculty (EC, GI) preselected these four competitors based on their scores, which was assigned on six criteria graded from 0 (lowest score) to 10 (highest score): originality of the therapeutic project, ability to choose materials, evaluation of the procedural steps, planning skills, global pathology overview, and discussion capacity. The four selected competitors subsequently presented their case solution during the online meeting focusing on sizing and planning and discussed their choices with the faculty. At the end of the case presentation, the effective case resolution was presented with all materials and procedural steps, then the follow-up and medical therapy were provided. The discussion was also enhanced by instant polling and live chat between the audience and the faculty. At the end of each webinar, there was the choice of the winner by televoting, based on a balance of votes mentioned elsewhere in this article. The awards were for participation were a cadaver laboratory course on vascular and endovascular techniques; a 1-week in-hospital training course in an major Italian vascular center, or a 4-week travel grant to visit a major European aortic center. The Italian and international faculty was quite large and was chosen on the basis of the extensive experience of the surgeons in the

Table I. List of collaborators of "Televascular Games"

Founders: Emiliano Chisci, Stefano Michelagnoli (San Giovanni di Dio Hospital, Florence, Italy)
International panel
Nuno V. Dias, Roberta Vaccarino (Sweden), Li Dong-lin (China), Florian Elger, Franziska Heidemann, Tilo Kolbel, Giuseppe Panuccio, Konstantinos Donas, Kyriakos Oikonomou (Germany), Vincent Jongkind, Kak Khee Yeung (The Netherlands), Vladimir Makaloski (Switzerland), Timothy Resch, Kim Christian Houlind (Denmark), Petar Zlatanovic, Igor Koncar (Serbia), Lorenzo Patrone, Hani Slim (UK). Matthew T. Menard (USA).
Italian panel
St. Agostino-Estense Hospital, Modena (R. Silingardi, S. Gennai); Mauriziano Hospital, Turin (E. Ferrero, M. Ferri, A. Gaggiano); University Hospital of Bari, Bari (R. Pulli); University Hospital of Perugia, Perugia (G. Isernia, M. Lenti, G. Parlani, G. Simonte); University Hospital of Turin, Turin (F. Verzini); University of Insubria, Varese (M. Tozzi); ACO San Filippo Neri, Rome (S. Ronchey); University La Sapienza, Rome (W. Mansour, F. Speziale, P. Sirignano); Vittorio Emanuele Hospital, Catania (G. Bernardini); San Giovanni di Dio Hospital, Florence (F. Masciello, A. Alberti, Claudio Raspanti, Francesca Calcagni); University Hospital of Pisa, Pisa (N Troisi); Policlinico Santa Maria alla Scotte, Siena (G. de Donato, G. Galzerano); IRCCS Agostino Gemelli, Rome (G. Tinelli, Y. Tshomba); Ospedale Civile Sant'Andrea, La Spezia (A. Amico, M. Barattini); Santissima Annunziata Hospital, Taranto (V. Semeraro), University Hospital of Florence, Florence (A. Fargion); University Hospital of Parma, Parma (A. Freyrie, P. Perini), San Raffaele Hospital, Milan (A. Kahlberg, L. Bertoglio); S. Donato Hospital, Arezzo (L. Ercolini, G. Ventoruzzo); Ospedali Riuniti di Livorno, Livorno (R. Arpesani); Ospedale Riuniti, Ancona (E Gatta); Fondazione I.R.C.C.S. Policlinico San Matteo, Pavia (A. Bozzani, L.P. Moramarco); G. Brotzu Hospital (S. Camparini); San Gerardo Hospital, Monza (V. Segramora, G. Deleo); "Card. Panico" di Tricase, Lecce (CP Dionisi); IRCCS Ospedale Sacro Cuore Don Calabria, Negrar (L Garriboli); M.Bufalin Hospital, Cesena (G. Iacono); Santa Croce Hospital, Cuneo (M. Maione); University Hospital of Verona, Verona (L. Mezzetto), AOU Citta della Salute e della Scienza, Turin, (M.A. Ruffino); Maggiore Hospital, Crema (A. Spinazzola); University Hospital of Padova, Padova (M. Antonello, M. Piazza, A. Dall'Antonia); San Giovanni Addolorata Hospital, Rome (C. Ferrer, C. Coscarella), Tor Vergata Univerity Hospital, Rome (S. Fazzini); Ospedali di Trento e Rovereto (S. Bonvini); Biella Hospital (M.Aronici).

aortic field. All of them supported the event voluntarily. A detailed table (Table I) shows all the collaborators of the 13 events. The project was endorsed by the International Union of Angiology, the Italian College of Chiefs of Vascular Surgery, and the Italian Vascular and Endovascular Surgery Society, and promoted by the Society for Vascular Surgery. The webinar and the data sharing herein described conform with the Italian Health National System rules. As far as granting international accreditation, we have followed the European Accreditation Council for Continuing Medical Education regulations, respecting their terms and conditions.

RESULTS

Between October 2020 and December 2021, there were 12 Italian and 1 international webinars with 1695 participants overall (mean, 130; range, 86-177). Competitors were 54 years old (mean, 27; range, 22-38 years). A single session lasted 120 minutes and audience drop off was not significative, varying from 1% to 4 % after 60 minutes and 3% to 6% at 120 minutes. The sessions were attended similarly over time, even after pandemic restrictions were lifted. Regarding the training level of the various competitors, we can summarize as follows: (1) medical students (aged 20-25 years old), (2) young vascular surgery trainees (aged 25-30 years old), and (3) young vascular surgeons (aged >30 years old). There are different training paradigms around the world for a certificate in vascular surgery and for the Europeans; more details can be found at https://www.uems.eu/__data/assets/pdf_file/0015/130830/ETR-Vascular-Surgery.pdf. The level of training across Europe varies, but currently it is mostly integrated with general surgery for approximately 6 to 24 months and then with vascular surgery. Two editions were CCCs (15%), two QCs (15%), and nine PCCs (70%). The κ values were 0.43 (95% confidence interval [CI], 0.36-0.49) for the proximal sealing zone, 0.62 (95% CI, 0.46-0.71) for the distal sealing zone, 0.88 (95% CI, 0.85-0.91) for any target vessel orientation (clock position), 0.94 (95% CI, 0.92-0.97) for any target vessel angulation of more than 60°, and 0.95 (95% CI, 0.94-0.98) for the presence of significant calcification (circumferential), and 0.82 (95% CI, 0.76-0.87) (Table II). The sizing discrepancy resulted in a significant variability of the planning ($\kappa = 0.45$). The variability of κ values observed in the 13 events was constant. The project ranked on a 10-point rating scale was 9.6 by all the participants and competitors. All Italian regions were involved in the national event (Fig 2, *A*); the international event drew participants from five continents (Fig 2, *B*). The delivered awards were five cadaver laboratory courses on vascular and endovascular techniques, two 1-week in-hospital training courses in a major Italian vascular center, and one 4-week travel grant to visit a major European aortic center. The Televascular Games events received important positive feedback from the social media, with more than 51,500 visualizations on Linkedin (www.linkedin.com/).

The whole project has reached a total of 40 Italian CME credits and 2 international CME credits.

Example of a discussed case

Event of June 8, 2020: Case 2. Televascular International Games: Planning competitions on thoracoabdominal aortic aneurysms (Supplementary Fig). A preoperative, 1-mm slice CTA of a 68-year-old female

Table II. Kappa values for all competitors

Poor	Fair	Moderate	Good	Very good
0-0.20	0.21-0.40	0.41-0.60	0.61-0.80	0.81-1
Measure of				**Competitors (n = 54)**
Proximal sealing zone				
Distal sealing zone				
Any target vessel orientation (clock' position)				
Any target vessel angulation >60°				
Significant calcification (circumferential)				
Thrombus presence (>50%)				

A color code is given for different class of agreement: 0-0.20 as poor (black), 0.21-0.40 as fair (blue), 0.41-0.60 as moderate (red), 0.61-0.80 as good (orange), and 0.81-1 (green) as very good agreement.

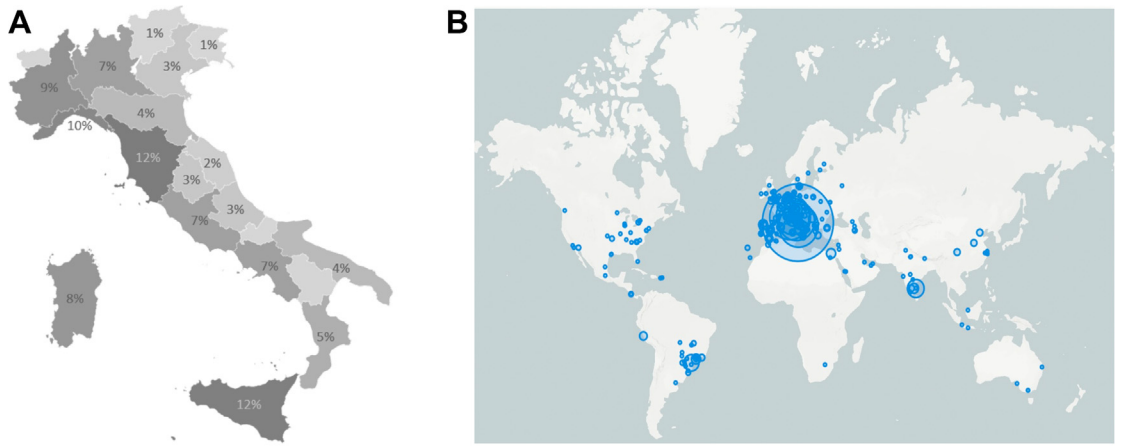

Fig 2. Map and rate of participation of the Italian regions involved in the national event **(A)** and distribution of participants of the international event **(B)**.

patient with a symptomatic 56-mm type IV thoracoabdominal aortic aneurysm was provided. A non-aneurysmal tortuous, calcified iliac axis was present bilaterally with a stenotic right hypogastric ostium. A large lumbar artery at L5 was present (5 mm) and the left renal artery was occluded chronically. No clinical information is given to the competitor, only the imaging. The anonymized DICOM files of the preoperative CTA were shared on Google Drive (Google, Mountain View, CA) and protected by a password. Competitors downloaded the DICOM files and evaluated the case. To join the contest, the participant submitted a PowerPoint file in which he or she specified the diagnosis, sizing, planning, procedural steps, adjunctive maneuvers, description of the type of interventions and materials to be used, bail-out maneuvers, intended strategies to prevent paraplegia, medical therapy, and type of follow-up (see the Supplementary File for a Televascular Games template). The prize for this event was a 4-week travel grant to the Aortic Center in Hamburg, Germany (directed by TK). Two different participants were selected for the online discussion of this case, one from Europe and the other one from Asia. The diagnosis was correct for both competitors. In Table III, detailed sizing measures of the two competitors and the official sizing (sizing of the faculty member who submitted the case) given are reported. The planning given was very different. Competitor 1 planned to deliver a physician-modified fenestrated endograft with three minicuff-augmented fenestrations as a first step,[11] and then as a second step an aortic bifurcated EVAR. Spinal drain insertion was planned electively the day before the operation. Competitor 2 planned a custom-made three outer branched device and then as a second step an aortic bifurcated EVAR. Spinal drain insertion was planned to be only on demand. The solution of the case was a single stage procedure due to the symptomatic status. A T-branch (Cook Medical, Bjaeverskov, Denmark) was deployed using the left renal branch to vascularize the large lumbar artery to decrease the risk of paraplegia. Stenting of the ostium of the right hypogastric artery was performed for the same purpose. The distal landing zone was completed by

Table III. Detailed sizing measures of the two competitors and the official sizing given for the case 2, International event of June 8, 2021

Sizing	Competitor 1	Competitor 2	Official sizing (solution given)
Location of proximal landing zone and diameter	Distal thoracic aorta	Distal thoracic aorta	Distal thoracic aorta
	31 mm	32 mm	33 mm
Celiac trunk (diameter and clock position)	7.5 mm	6.8 mm	6.5 mm
	12:00	11:45	12:00
Relative aortic diameter	46 mm	49 mm	42 mm
Superior mesenteric artery (diameter and clock position)	8 mm	7.7 mm	7.6 mm
	12:00	11:30	12:00
Relative aortic diameter	45 mm	46	46
Right renal artery (diameter and clock position)	6.5 mm	5.2 mm	5.1 mm
	09:30	09:00	09:15
Relative aortic diameter	43 mm	43 mm	42 mm
Left renal artery(diameter and clock position)	Occluded	Occluded	Occluded
Relative aortic diameter			
Aortic bifurcation diameter	22 mm	28 mm	29 mm
Right common iliac artery	11 mm	11mm	11.1 mm
Right external iliac artery	6.5 mm	7 mm	6.5 mm
Left common iliac artery	12 mm	12.5 mm	12.6 mm
Left external iliac artery	8.3 mm	8 mm	7.6 mm
Location of distal landing zone	Distal bilateral common iliac artery	Distal bilateral common iliac artery	Distal bilateral common iliac artery
Any target vessel angulation >60°	+	++	++
Significant calcification (circumferential)	+++	++	++
Thrombus presence (>50%)	++	++	++

using the unibody bi-iliac stent graft and an iliac limb from Cook Medical. There was great variability in bridging stent selection for each target vessel in terms of type (balloon vs self-expandable stent graft) and brand used. A 2-month follow-up imaging was provided with evidence of patency of all target vessels, iliac arteries, absence of endoleak, and absence of any complication.

DISCUSSION

In 2016, The Televascular Group was founded and worked on a project with the aim of discussing complex cases of thoracoabdominal aneurysms by teleconference.[12] The main objective was to create a working group in which the combined expertise could collectively identify the best treatment and a possible therapeutic standardization for complex diseases where guidelines are frequently lacking. Another goal was to build a culture of sharing and collaboration among physicians. Sharing therapeutic choices and care strategies in a work group can also be of medicolegal support.[13-24] The work of this group highlighted that a second opinion can be essential when the therapeutic strategy is not clear. After this preliminary experience, a new project called Televascular Games kicked off in 2020. A new format of online competition has been created, in which young vascular surgeons can openly discuss challenging cases on aortic disease. They discussed how to size, plan, the possible procedural steps, the materials used, medical therapy, adjuncts needed, and follow-up. To enhance discussion and participation, a prize for the competitors was established. The proposed model of online competition is simple, economically sustainable, and effective in spreading the idea of the need for a second opinion. In fact, no case discussed resulted in the same therapeutic solution, with significant variability among competitors. Moreover, in this study the interobserver reliability for different measurements was not ideal among the competing surgeons, as in case of proximal and distal sealing measurements. This was the main cause for the scarce concordance in planning ($\kappa = 0.45$). A successful endovascular procedure relies on accurate preoperative imaging for proper operative planning. The poor interobserver

reliability of measurements may be a warning for possible failures.

This methodology has never been reported for vascular surgery and, in our opinion, can help to strengthen professional links when otherwise impossible, owing to the COVID-19 pandemic. We strongly think that technology can allow health care professionals in multiple locations to share information and discuss patient issues as if they were in the same place. The Televascular Games could be considered as an incentive to instill the need of a second opinion in young surgeons; after one case is presented, the same question should arise: how would you have treated it? And the answer after more than 50 discussed cases was never the same. These events can also facilitate medical education by allowing young workers to observe experts in their fields and share best practices more easily.[10-13] The objective success of the event can be clearly summed up by the overall number of episodes and participants and by the educational credit given by the Italian Society of Vascular Surgery and by the Italian College of Chiefs of Vascular Surgery. The Televascular Games webinars will not stop after significant relaxation of COVID-19 protocols and, in fact, five more events are scheduled in 2022. It is not easy to estimate the overall educational impact of this competition, but a solid Italian Televascular working group and network have been then created: if a young member would like to discuss a case outside an event, he or she is able to directly ask one or more senior members to help solve his or her case. Possible downsides of such events include the cost of the web conference itself, awards, and data management.[15] Regarding these issues, the Televascular Games were administered by one surgeon (EC) during his working time with no adjunctive costs; the costs of the awards, creation of the Televascular Game platform, the use of the ZOOM platform, and the associated secretarial work were covered by nonbinding financial support of external industry sponsors. The industry partners of the Televascular Games project in alphabetic order were: Artivion (ex Cryolife, Jotec), Bard, Cook Medical, W. L. Gore & Associates, Le Maitre, Medtronic, Penumbra, Terumo Aortic, and Terumo Peripheral. The Google Drive software, which was used for data storage, is free. An issue might be an increased risk regarding the fact that protected health information may be compromised through electronic storage and transmission. This risk was overcome by anonymization and through the storage of all data and CTA in the Google Drive files protected by a dual password. The access for any participant was granted only after the requesting physician was fully registered in the Televascular platform. The CTAs were then reconstructed in each center using the preferred DICOM software. From this experience, we learned how important case sharing can be and to compare proper sizing and planning, whenever possible. The format, the case discussion, the quality of discussion, and the faculty were really appreciated in an anonymous postevent feedback satisfaction survey. The only two emerged criticisms were related to (1) the length of the episode, which should be less than 90 minutes instead of 120 minutes as usually performed and (2) the size of the faculty, which should be decreased to fewer than 15 members per episode to have a more focused discussion with competitors (normally, the faculty was more than 20 members). These two criticisms were accepted by The Televascular Games working group and in fact the next episodes will last 90 minutes and the faculty will be decreased to fewer than 15 members.

CONCLUSIONS

The formula of gaming and collegial discussion of aortic cases herein reported has proven valid and attractive during the COVID-19 pandemic period. The variability of the results on sizing and planning highlighted the importance of a second opinion and the need of validation by another experienced surgeon.

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