A novel scoring system to reduce bias in placental microsurgery training

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ABSTRACT

Objective: The manual skills required for microsurgical interventions have reached a level of complexity that presents a significant challenge to practitioners. The assessment and validation of these skills have become a fundamental aspect of training programs, with the implicit responsibility of establishing specific and efficient methodologies, as well as the proper validation of acquired skills. It is of paramount importance that a training program is free from bias, particularly in relation to the selected simulator details. In order to provide enhanced training quality and accurate results, this paper presents a novel and logical approach to classifying a placental simulator.

Method: A standardized microsurgical training protocol, previously published in the literature, was performed with the addition of a new variable for the assessment of vascular quality and measurement of simulator difficulty level (SDL). This quality assessment was also intended to serve as a comprehensive understanding of the current difficulty level of the particular simulator, allowing the operator to adjust a proper level of caution and finesse. Subsequently, a statistical analysis was conducted to examine the impact of the SDL on the protocol main variables.

Results: Thirty-four placentas were used for sixty-three procedures. The time decreased from 42 minutes (first attempt) to 21 minutes (attempt number 47). Then a plateau level was reached with small variations in time. The mistake rate also decreased from an average of 35% major mistakes to 12.25%. Even after reaching the plateau level, both time and mistakes shown irregular and small variations.

For 21 samples graded as High difficulty (HD), the mistake score accounted 53, with an average of 2,52. For 31 samples graded as Regular difficulty (RD), accounted 24, average of 0,77. For 11 samples graded as Low difficulty (LD), accounted 6, average of 0,54. These results were confirmed after filtering for “first procedure on that simulator” only.

Addtitionally, it was found that a second attempt on the same simulator was always a more quality (less mistakes made) and faster (less time to achieve the goal) one.

Conclusion: The SDL score (assessed by measuring vascular and perivascular variables) demonstrated the anticipated concordance with the time taken and the errors committed. The SDL score and its interpretation

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can be effectively employed to reduce bias and justify the variance resulting from minor simulator discrepancies.
Details about regular variations (arising from the biological substrates used as simulators and/or real surgical scenarios) should be taken into account when assessing the effectiveness of microsurgical procedures.

Keywords: Microsurgical training, Simulator assessment, Skill validation, Difficulty level.

INTRODUCTION

The training of microsurgical skills has become a significant global demand and an important academic challenge [1]. The surgical technique has evolved in many fields, with the use of the surgical microscope becoming increasingly prevalent for a range of procedures. These include tumor resection, artery bypass, soft tissue/flap reconstruction, and ductal re-permeabilization, among others.

The skills required for these types of procedures necessitate proper instruction, education, and training. The role of microsurgical training centers has become fundamental [2]. According to recent publications, the time required to acquire basic but consistent skills at high magnification levels ranges from 40 to 150 hours at the microsurgery laboratory, always under a properly designed and validated protocol [3,4].

The requisite dexterity for microsurgical procedures necessitates a considerable investment of effort to acquire and subsequently maintain. Consequently, training centers should be equipped not only for instructional purposes, but also for regular practice.

The issue of accessibility and affordability of microsurgical education and training represents a significant challenge. Approximately a half of the hospitals and care centers where microsurgery is performed lack a microsurgical training center within the same city, whether for initial instruction or training. The remaining half that do have a training center in the same city, face significant challenges in accessing or affording instruction or training. This situation is particularly prevalent in developing countries [5].

In light of the aforementioned points, it is recommended that the use of efficient methods, which facilitate the reduction of learning curves and microscope working times, and the selection of appropriate yet cost-effective simulators, be encouraged.

In the domain of microsurgery training, particularly concerning placental microsurgery, several authors have explored scoring systems aimed at reducing bias and enhancing competency assessment.

First, an interesting contribution is from Colombian authors [6], who implemented a practical training course using dye-perfused human placentas. In their study, participants with varying levels of experience performed multiple surgical exercises and subsequently completed a questionnaire designed to evaluate their training experience. This approach underscores the importance of structured feedback in training environments, which is critical for minimizing bias in skill assessment.

Second, the development of standardized scoring systems, highlighted in other study [7], where the researchers introduced the SParTA Score, a new assessment tool specifically designed for microsurgical training. This scoring system allows for benchmarking performance and learning outcomes, thereby providing a reliable framework for evaluating trainees' skills and reducing subjectivity in assessments. Similarly, emphasized the necessity of validated tools for objective assessment in microsurgery, noting that traditional methods often lack the rigor needed to ensure consistent evaluation across different trainees [8].

The significance of structured training programs is also analyzed in other work [9], who investigated the objectivity of scoring in microvascular anastomosis simulation training. Their findings suggest that the implementation of objective scoring criteria can enhance the fairness and reliability of evaluations, thereby addressing potential biases inherent in subjective assessments. This aligns with the broader literature advocating for competency-based training frameworks, which necessitate accurate and objective assessment tools to define and quantify surgical skills effectively [10].

Moreover, the exploration of alternative training models, such as the three-step approach [11], which utilizes latex gloves, endovascular prostheses, and human placentas, further illustrates the innovative strategies being employed to enhance training efficacy while minimizing bias. This method not only prepares trainees for clinical applications but also provides a comparative framework to validate training outcomes.

Therefore, the integration of structured scoring systems and objective assessment tools is central in reducing bias in placental microsurgery training. The collective insights from these authors highlight the necessity for standardized evaluation methods that enhance the reliability of skill assessments and ultimately improve training outcomes.

Regarding equipment, the variety of simulators is considerable, encompassing different types, objectives, and costs. The microsurgical training process begins with the use of inanimate objects to develop fundamental skills. This is followed by the manipulation of biological tissues to gain familiarity with the characteristics of real tissue and to practice “optimal tension” [12] while handling different components. Ultimately, experimental animals can be employed as simulators, with or without recovery periods. The former option is costlier and raises ethical concerns but offers a superior level of simulation.

The use of placenta as a simulator provides a reliable and proven method for obtaining and maintaining microsurgical skills [13,14,15]. However, some information gaps have been identified in this regard. Due to regular variability, labor nuances, maternal clinical records, previous pathologies, and pregnancy factors such as eclampsia, diabetes, and obesity, the tissues of different placental samples can vary significantly. These circumstances have the potential to introduce significant bias in the comparison of data from microsurgical training procedures, which could have direct implications for the evaluation of the operator's skills and the implementation of modifications to the training program. Furthermore, the comparison between different operators may be misinterpreted or even impossible.

Finally, the introduction of the Simulator Difficulty Level (SDL) score is a significant advancement in microsurgical training. The objective of this paper is to synthesize the aforementioned issues and present a novel theoretical and practical instrument for circumventing placental simulator bias. In this vain, by quantifying the difficulty of placental simulators, the study provides a structured method for assessing training effectiveness, which is critical in a field where precision and skill are paramount. The next section will focus on the materials and the methods involved. Then, the results of the fieldwork will be showed. On this basis, we will discuss these results for concluding with some recommendations.

MATERIALS AND METHODS

A kaizen/therblig-based protocol [4] that had been previously tested and published was selected to conduct this study. The full methodology was retained with slight modifications to reduce the task time.

The "only 1 operator" technique was also retained as an extra precaution to avoid inter-operator bias and to focus on the features and peculiarities of the simulator.

In addittion, a new exclusion criterion about the use of the simulator was created, aiming to assure the biological tissue optimal condition: any placental simulator more than 6 hours after labor and delivery had to be discarded. No preservation methods were allowed for this trial, only blood and clot washing with wet gauze over the fetal side.

WORKSTATION

Optical microscope 50X maximum magnification level, continuous zoom lens, foot control for zoom and focus. Led light system, manually adjusted.

Basic set of instruments (2 forceps, 1 vascular dilator, 1 side-curved scissors).

Vascular suture, mononylon, 11/0.

PROTOCOLLED TASK PROGRAM

1- **Setup**: a biological simulator was placed on the laboratory table, following the same rules as the previous Kaizen/Therblig experience [4]. The exposure was flat and directly under the microscope to avoid any interference related to position, angles and handling of the optical device.

2- **Simulator difficulty level (SDL) test:** after selecting a Grade II arterial vessel between 1.5 and 2.5 mm, 4 maneuvers were designed to assess vessel and perivascular connective tissue characteristics.

A) Thickness: dissecting the near side of the selected vessel (Figure 1.a) for 10mm. During this step, the thickness of the perivascular connective tissue was classified from very thick, to very thin (Table 1).

B) Flexibility: dissection all around the vessel (Figure 1.b). Once the vessel was freed from its bottom surface, a thin latex layer was placed under the vessel to assure complete 360 degrees dissection. Finally, taking the vessel perivascular connective tissue from proximal and distal dissected extremities, the bottom surface attempted to be exposed and a small torsion force was applied for this goal. The vessel response was then classfied from very flexible, to very rigid (Table 1).

*C) Adhesion: d*issection over the top surface of the vessel down to the adventitial level (Figure 1.c). During this step, different layers were manipulated and separated/cut off. The adhesion shown by those layers, specially those near vessel adventitia, was classified from very adherent, to very loose (Table 1).

D) Wall: during the previous step (adventitia dissection) or while working directly on the vascular wall (while suturing at the final stage of the procedure assesment), the vessel and perivascular tissue was closely watched (Figure 1.d). If some of those maneuvers caused partial or complete disruption of the vessel walls or borders, it was classfied within the range of very friable to very strong vessel wall (in accordance with the safety and correctness of the maneuver that caused disruption) (Table 1).

Once all classification steps were completed, the difficulty of the placenta was determined using a numerical scale (ranging from -8 to +8) and subsequently graded with a final assessment, resulting in three categories: Regular difficulty, High difficulty, and Low difficulty (Table 2).

3- Assessed Procedure (details can be seen at reffered articles[4])

1) *Artery dissection:* perform a 360-degree dissection around a 1 mm artery. A thin latex or plastic layer should be able to pass underneath the completely exposed vessel.
2) *Adventitia dissection:* all connective tissue should be dissected from the vessel wall, leaving only the adventitia or near-adventitia layer. The primary goal of this task is to eliminate any connective tissue that may occlude the vessel once it is cut, or any connective tissue flap that may protrude into the vessel lumen after suturing.
3) *Termino-Terminal suture:* once the adventitia dissection is performed, the vessel is cut with scissors. Then a termino-terminal bypass technique with a 11/0 suture following the

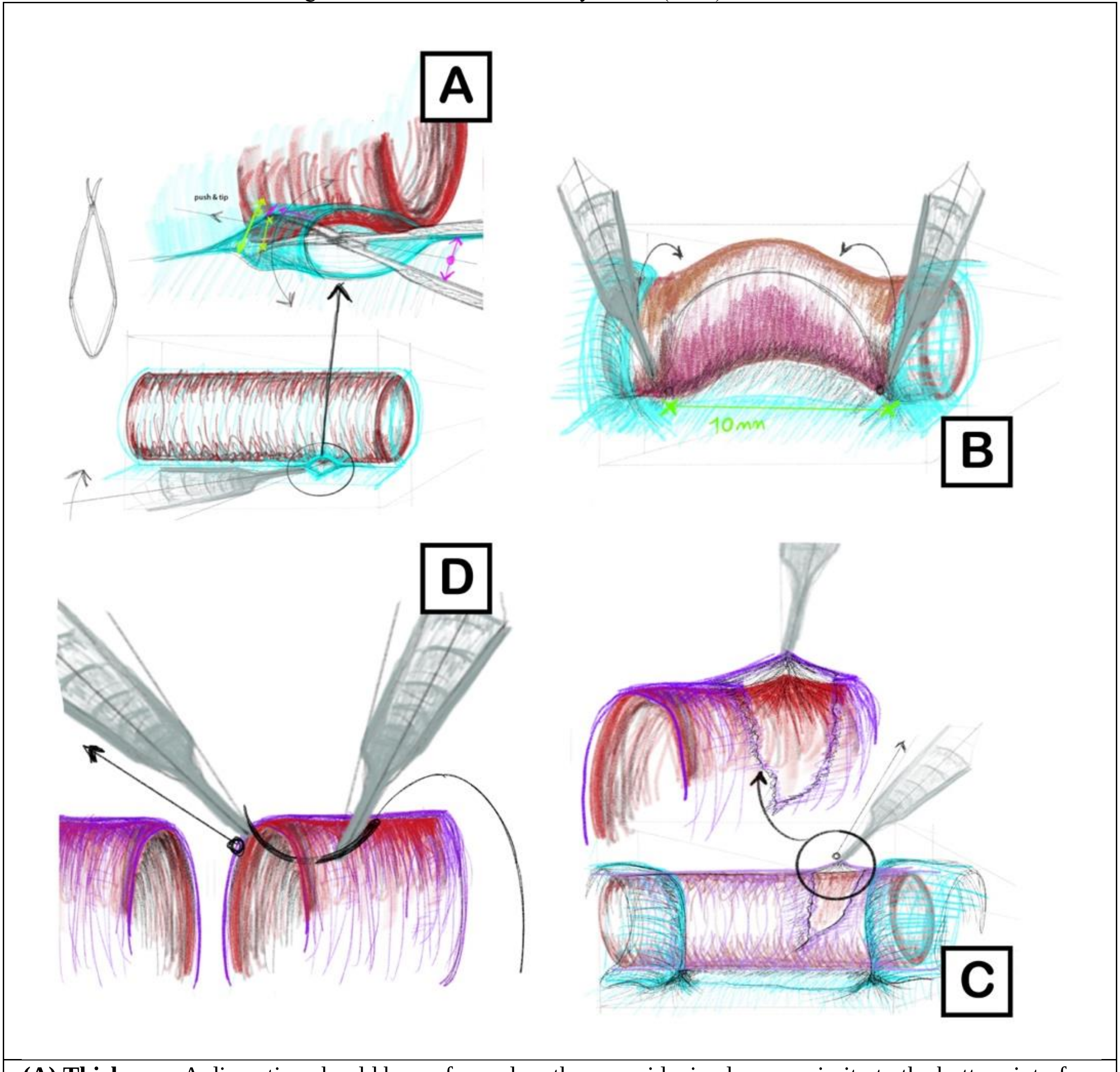
previous protocol and advice [4] was performed. Five stitches were required. After suturing, a patency test was requiered to assess suture quality.

Time elapsed for each task and mistakes score should be registered following the previously published protocol instructions.

DATA COLLECTION AND ANALYSIS

Following the same Kaizen-based protocol, data were collected and a database built (raw data table is shown at the addtitional material section). Time, mistakes and SDL were given with numerical and precise values. Statistical analysis was then performed to identify correlations and significant associations.

Figure 1 – Simulator Difficulty Level (SDL) assessment



(A) Thickness: A dissection should be performed on the near side, in close proximity to the bottom interface between the most superficial layer and the vessel wall. Once a small window has been created, blunt dissection allows the identification of a tissue plane that can be passed below the vessel, while preserving an underlying connective sheet. **(B) Flexibility:** Following a comprehensive superficial dissection along the near side (10mm), the connective tissue should be retracted to the proximal and distal sides (light green in this

illustration). Subsequently, remaining connective tissue along vessel wall should be taken with forceps on both sides, after which the vessel should be rotated to expose its bottom side. **(C) Adhesion:** Following the elimination of superficial connective layers, the near adventitia should be dissected with precision and care. Once the top surface of the vessel has been reached, the layer should be taken with forceps and traction applied. The response of the underlying vessel wall is then observed, looking for adherence that is strong enough to avoid separating it from the vessel wall. **(D) Wall:** Once dissection of free borders is completed, suture begins. The needle passing through the vessel wall and the traction made by the suture line over the vessel border should be observed.
Source: own ellaboration.

Table 1 – Simulator difficulty level maneuvers description and scoring

Maneuver	Description	Focus	Score
Thickness	Blunt dissection over the bottom and superficial margin of the near side of the vessel	The ammount of connective tissue that has to be dissected to gain the bottom plane to go under the vessel (a thin layer looks trasnparente and smooth, low volumed / a thick layer looks dull and lackluster, high volumed)	+2 very thin +1 thin Regular -1 thick -2 very thick
Flexibility	After 360 degree dissection of the superficial layer, along 10mm of the vessel major axis, rotation applied with two forcesp attemps to expose bottom face of the vessel	The fraction of the bottom side of the vessel that can be obsreved and the reaction of the vessel while stopping the rotational forces over it (a flexible vessel easly expose	+2 very flexible +1 flexible Regular -1 rigid -2 very rigid
Adhesion	When connective tissue over the vessel was dissected and just a thin layer of near-adventia level remains, a fine forceps grips it to apply gentle traction to separete it from the vessel wall.	While applying gentle traction, the vessel wall should be carefully observed (low adhesion level allow to separete this layer from vessel wall without difficulties / high adhesion level is noted when the vessel wall is pulled with the near adventitia)	+2 very low adhesion +1 low adhesion Regular -1 high adhesion -2 very high adhesion
Wall	While working over the completely dissected vessel wall (mostly at the adventitia dissection stage) and/or suturing at the assessed procedure stage, special care should be taken to observe the response on that wall.	A friable vessel can be damaged with a gentle and well performed maneuver, while a strong vessel can be very resistant even under rough maneuvers over it.	+2 very strong +1 strong Regular -1 friable -2 very friable

Source: own ellaboration

Table 2 – Numeric guide for definitive simulator difficulty level (SDL) scoring

SDL	Numeric value assigned by maneuvers
Low difficulty	From (+2) and higher
Regular difficulty	From (+1) to (-1)
High difficulty	From (-2) and lower values

Source: own ellaboration

It should be noted that additional data was collected regarding the appearance of the placenta. This included the presence of vascular proliferation (defined as the surface percentage with a vessel at least 1mm in diameter), umbilical cord implantation (classified as marginal, velamentous, central, or para-central), and other surface characteristics (such as bleeding, hematomas, or lipidic inclusions). These supplementary observations were not incorporated into the difficulty level classification, but are mentioned here just as a reference.

RESULTS

The first two samples were discarded due to exclusion criteria (sample 1 did not arrive the microsurgical workstation before 6h from labor/delivery; sample 2 was mantained with ice for 3h before arrive the microsurgical workstation).

All records were taken following the protocol. The main raw data can be observed at additional material section (for its lenght it was placed at the end of the document).

Protocol main goals were confirmed (hand skill improvement): the initial time of 42min to complete the task, diminished significantly up to 21min; average major mistakes made in the first 20 samples was 35%, decreasing to 12,25% at the end of the trial.

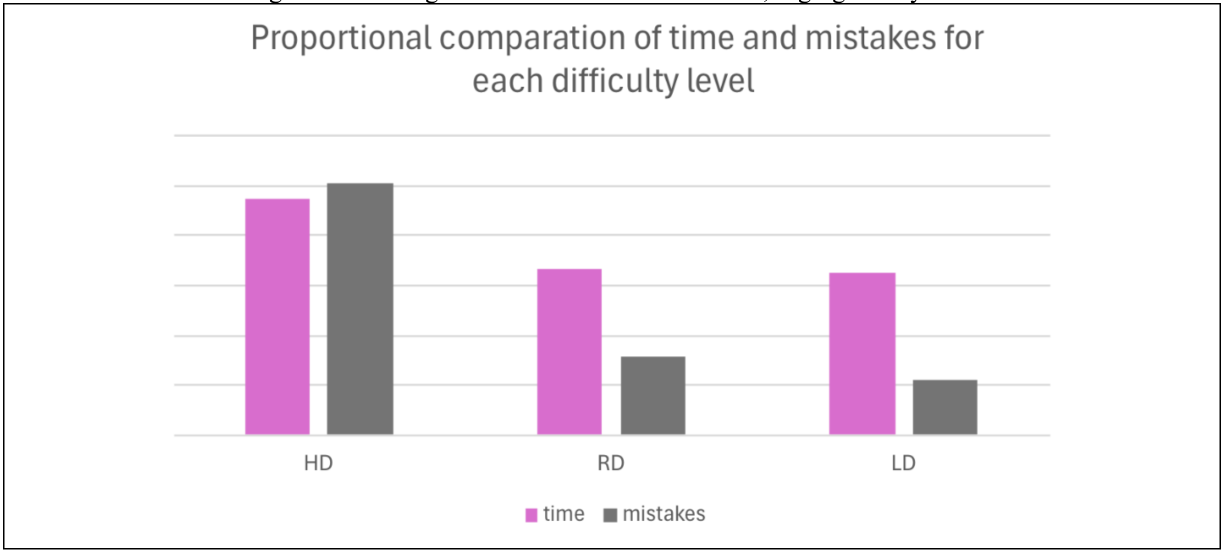
By analyzing variations patterns among all of the results, a regular variability was observed ("regular variability" definied as the tendence to increase and/or decrease in time and mistakes, for a specific protocol, with a single and skilled operator, and operating at a controlled scenario).

Once every simulator was classified, the resulting variables were confronted with the time and mistakes scores.

For 21 samples graded as High difficulty (HD), the mistake score accounted 53, with an average of 2,52. For 31 samples graded as Regular difficulty (RD), accounted 24, average of 0,77. For 11 samples graded as Low difficulty (LD), accounted 6, average of 0,54.

From 21 HD samples, the mistake score met exclusion criteria in 5 of them. The remaining 16 samples accounted 37661 seconds to be concluded (Average 2353,81 seconds). From 31 RD samples, the mistake score met exclusion criteria in 1 of them. The remaining 30 samples accounted 49924 seconds (Average 1664,13 seconds). From 11 LD samples, there were no exlusion due to mistake criteria, accounting 17807 seconds (Average 1618,82 seconds) (Figure 2).

Figure 2 – Average time and mistakes commited, segregated by SDL



Source: own elaboration. Time refers to the total time needed to complete the task (average). Mistakes refers to the total ammount of mistakes commited during the task (average).

It was observed that more than one procedure was performed using the same placenta, showing a particular situation: the first attemp was always longer in time, and higher in mistakes, than a second or third attempt (always using the same placenta).

To eliminate any potential bias due to a facilitated ability rather than a simulator characteristic, a comparable assessment was conducted, but in this case, only using the first attempt on each simulator.

The number of first attempts was 26 (HD 10 with 3 exclusions / RD 12 with 1 exclusion / LD 4 with no exclusions). Resulting average mistake numbers were: HD 3,5 / RD 1,08 / LD 0,75. Resulting average time numbers were: HD 1943,14 / RD 1706, 54 / LD 1791,75.

The present experience has also exposed some data about this respect: after a few days without practice, the hand skills showed a regression to earlier stages of dexterity (see the results section, sample 49 and 50), just 14 days without training showed the same procedure going slower and erratic.

A series of statistical tests were conducted to ascertain the existence of a genuine correlation between the SDL and the variables associated with the procedure, namely time and mistakes. The results of the *Chi-square* and *Asyntotic Significance* tests are as follows: a) HD samples were found to be correlated with higher mistake rates, and b) it was determined that a greater number of procedures should be tested in order to confirm the apparent correlation between SDL levels and time.

DISCUSSION

It is relatively uncommon to have access to a microsurgery training center that is conveniently located and affordable. Furthermore, such centers do not always offer an approved training protocol and hand skills personalized teaching, improvement, and certification.

The ongoing evolution of technology has introduced a plethora of sophisticated visual aids, including hybrid microscopes, exoscopes, and roboscopes, along with an array of other sophisticated technological tools, which have the potential to enhance microsurgical procedures. These technological advancements have presented a formidable challenge to surgeons' skills on a global scale, at the context of various surgical specialties.

Social and economic factors are inextricably linked to surgical indications, available technology, and training requirements. Unfortunately, these factors are unevenly distributed in resource-poor areas and developing countries. This is a significant challenge that requires innovative solutions to ensure that excellence in microsurgery is accessible to all.

To improve the effectiveness of protocols and training, carefully analysed programmes should aim to use a dedicated and proven methodology. Consideration of significant variables, accurate measurement and quality instruction are now the gold standards for achieving and maintaining operator proficiency.

By using the Kaizen/Therbligs methodology, a protocol and its objectives can be designed in accordance with the socio-economic situation, maintaining high quality standards and also demonstrating the ability to identify specific points for improvement and incorporate novel tools to improve and refine outcomes.

When evaluating overall results in large microsurgical training series, discrepancies in results may have multiple causes and origins, but all of them generating unidentified variables, not subject to measurement and acting as a bias provider. One of these multiple causes may be related to the biological characteristics of the simulator, in particular the "regular variability".

This last named concept reflects a real surgical situation (or a simulated context using a biological simulator) in which not all surgical scenarios are identical, even when confronted with analogous pathologies and controlled environments.

The SDL test enabled the operator to obtain supplementary data regarding the immediate characteristics of the simulator. The utilisation of a group of minor movements or preliminary strategies to ascertain specific features that may exhibit regular variations, appears to be relevant while analysing results.

The proposed set of maneuvers used to build the SDL score yielded two additional findings. The first was the SDL test itself serving as hands "warm up" in a safe scenario[16], thereby avoiding the initial period of increased risk due to rough micromovements during the evaluated proceudre.

The second was the importance of analyzing regular variabilities as an important procedure modifier, both for simulation and surgery. This warming up is strongly recomended by practitioners and routinely practiced by many microsurgical operators.

From other perspectives of this placenta-simulated trial, maternal records and pregnancy complications such as hypertension, diabetes, eclampsia, and others demonstrated correlations with placental descriptions. These findings extend far beyond the scope of this paper, but remain noteworthy. It may also be reasonable to correlate some of the findings with other placental imaging studies that have been previously published [17].

It is evident that regular variability is a common occurrence in all surgical procedures (and all biological simulations). It must be considered when working on procedures with potential biological diversity. The SDL tool has proven to be beneficial in identifying and avoiding biases by selecting appropriate sample classification, and by giving the operator solid and in-situ data to understand the level of additional care that is required.

Furthermore, the use of this kind of tools (dedicated to make a protocol more precise) will enable the avoidance of bias when reading results, evaluating skills and making comparisons.

The use of analogous indexes to assess regular variability in other surgical procedures could also be an important avenue for further investigation.

Finally, it is worth to summarize some key point in this discussion section that would contribute in the future to a more robust and comprehensive analysis of the training methodologies presented in this paper:

- Reaffirm this protocol effectiveness to improve hand skills (significant reduction in procedure time, from an average of 42 minutes during initial attempts to 21 minutes, after 47 attempts)
- The better integration of warming-up techniques.
- Addressing the information gaps regarding the placenta simulator.
- Exploring alternative training models.
- The importance of objective scoring criteria for avoiding bias.
- The broader implications of the findings for the field of microsurgery.
- Taking in count “regular variability” as an important bias generator.

CONCLUSION

This article presents a well-structured and innovative approach to improving microsurgical training through the development of a scoring system that reduces bias. In authors’ opinion, its methodological rigor, practical implications, and contributions to the field could make it a valuable addition to the literature on surgical education.

The newly developed SDL tool yielded measurements that exhibited a strong correlation with time and error values. These findings were instrumental in enhancing the precision of the procedure by circumventing simulator-associated bias. In light of this experience, the concepts of "regular variability assessment" and "pre-procedure warming up" were identified as meriting further investigation.

The findings mentioned have practical implications for surgical training programs, especially in resource-limited settings. By emphasizing the need for accessible and effective training methods, the study highlights the importance of improving surgical education globally.

Finally, the introduction of a "warming-up" phase before surgical procedures is a valuable recommendation. This practice could enhance skill retention and reduce errors, which is beneficial for both trainees and patients.

Future research should focus on the effectiveness of warming-up techniques, optimization of training duration, exploration of alternative training models, filling information gaps regarding simulators, and refining objective scoring systems. These lines of inquiry will not only enhance the training methodologies in microsurgery but also contribute to the broader field of surgical education.

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ADDTITIONAL MATERIAL

Protocol raw data

ATTEMPT	ARTERY	ADVENT	SUTURE	total	sdl	error	placenta
3	0:12:56	0:03:23	0:19:19	0:35:38		1	3
4	0:16:42	0:14:19	0:12:32	0:43:33		2	4
5	0:06:48	0:09:22	0:15:01	0:31:11		0	5
6	0:08:04	0:10:48	0:32:05	0:50:57		0	5
7	0:10:19	0:07:32	0:31:05	0:48:56	-5	0	9
8	0:12:12	0:03:07	x		-5	5	9
9	0:11:30	0:10:46	0:24:18	0:46:34	-5	1	9
10	0:06:44	0:06:37	0:14:00	0:27:21	1	1	10
11	0:07:15	0:02:15	0:17:08	0:26:38	1	1	10
12	0:07:26	0:15:46	0:11:30	0:34:42	1	0	10
13	0:08:39	0:09:53	0:13:42	0:32:14	1	0	10
14	0:04:06	0:08:25	0:19:48	0:32:19	5	1	11
15	x				-5	5	12
16		x			-5	5	12
17	0:07:52	0:08:28	0:16:02	0:32:22	-5	0	12
18	x				-3	5	13
19	0:11:51	0:10:48	0:17:59	0:40:38	-3	2	13
20	0:06:06	0:09:33	0:17:19	0:32:58	-3	1	13
21	0:07:54	0:09:59	0:20:23	0:38:16	-2	6	14
22	0:07:24	0:06:43	0:17:00	0:31:07	-2	1	14
23	0:04:52	0:05:38	0:16:29	0:26:59	-2	1	14
24	0:10:48	0:07:53	0:10:46	0:29:27	-5	0	15
25	0:08:04	0:05:08	0:22:01	0:35:13	-5	1	15
26	0:08:03	0:04:33	0:15:57	0:28:33	-5	0	15
27	0:11:10	x				5	16
28	0:07:57	0:07:03	0:24:33	0:39:33	-5	2	16
29	0:06:24	0:07:40	0:22:00	0:36:04	-5	2	16
30	0:04:48	0:09:08	0:24:38	0:38:34	0	0	17
31	0:07:06	0:12:26	0:14:16	0:33:48	0	0	17
32	0:11:52	0:03:14	0:15:47	0:30:53	-1	1	18
33	0:13:11	0:02:11	0:19:10	0:34:32	-1	1	18
34	0:08:00	0:04:00	0:20:16	0:32:16	-1	0	18
35	0:08:34	0:05:02	0:16:28	0:30:04	1	1	19
36	0:08:01	0:07:38	0:12:56	0:28:35	1	1	19
37	0:04:13	0:08:16	0:20:00	0:32:29	-1	1	19
38	0:07:02	0:05:40	0:10:51	0:23:33	-1	2	19
39	0:06:35	x			-2	5	20

40	0:04:20	0:06:27	0:17:35	0:28:22	-2	1	20
41	0:03:23	0:02:50	0:18:47	0:25:00	-2	1	20
42	0:12:25	0:04:02	0:14:29	0:30:56	-2	1	20
43	0:07:12	0:10:19	0:13:58	0:31:29	2	1	21
44	0:04:58	0:04:16	0:18:06	0:27:20	2	0	21
45	0:07:38	0:06:05	0:17:17	0:31:00	-2	1	22
46	0:05:03	0:06:19	0:15:42	0:27:04	2	1	23
47	0:08:09	0:10:20	0:15:48	0:34:17	2	1	23
48	0:05:21	0:04:00	0:15:56	0:25:17	2	0	23
49	0:04:59	0:04:42	0:13:17	0:22:58	2	1	23
50	0:06:10	0:06:45	0:22:12	0:35:07	-1	2	24
51	0:07:53	0:03:10	0:22:23	0:33:26	-6	6	25
52	0:05:01	0:01:55	0:15:27	0:22:23	-6	2	25
53	0:07:02	0:04:44	0:16:49	0:28:35	4	1	26
54	0:03:16	0:03:03	0:16:11	0:22:30	4	0	26
55	0:06:20	0:03:14	0:12:57	0:22:31	4	0	26
56	0:05:01	0:04:37	0:12:49	0:22:27	4	0	26
57	0:05:56	0:08:26	0:18:17	0:32:39	-1	0	27
58	0:04:45	0:04:39	0:14:36	0:24:00	-1	0	27
59	0:06:44	0:06:16	0:10:43	0:23:43	-1	0	27
60	0:03:50	0:04:29	0:08:45	0:17:04	-6	6	28
61	0:04:13	0:03:33	0:20:49	0:28:35	-6	1	28
62	0:05:28	0:06:15	0:13:13	0:24:56	-2	1	29
63	0:04:41	0:02:47	0:13:18	0:20:46	-2	0	29
64	0:05:43	0:06:56	0:12:41	0:25:20	0	0	30
65	0:08:01	0:02:30	0:18:02	0:28:33	-5	1	31
66	0:06:06	0:04:16	0:10:06	0:20:28	-1	1	32
67	0:04:38	0:03:43	0:13:45	0:22:06	-1	0	32
68	0:04:26	0:04:13	0:15:35	0:24:14	-1	1	32
69	0:03:51	0:04:58	0:11:28	0:20:17	-1	0	32
70	0:03:40	0:06:51	0:10:30	0:21:01	-1	1	32
71	0:03:46	0:04:37	0:15:32	0:23:55	-2	1	33
72	0:03:09	0:09:09	0:11:17	0:23:35	0	0	34

NOTE : the letter 'x' appears for a procedure where the level of error met the exclusion criteria. Then, according to the given protocol, the sample was discarded as valid, but taken into account for an overall assessment of the quality and performance of the protocol.