The Egyptian Journal of Hospital Medicine (April 2024) Vol. 95, Page 1664- 1670

Strangulated Inguinal Hernia in Mansoura: Clinico-Epidemiological Study

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ABSTRACT

Background: Because of a weakening in the muscular structure of the wall of the abdomen, an abdominal wall hernia is a protrusion of the abdominal tissues or organs that occurs in the abdominal cavity.

Aim: To report our current practice in Mansoura for strangulated inguinal hernia to identify incidence, types, methods of repair and risk factors related to postoperative complications.

Patients and methods: This prospective observational research was conducted on 183 patients of irreducible inguinal hernia who presented with irreducible inguinal hernia and they were admitted to Mansoura University Emergency Hospital and Mansoura International Hospital.

Results: The mean duration of the surgical procedure was 84.07 minutes. ICU admission was required in only two patients (2.8%), the duration of hospitalization ranged between 3 and 7 days. Regarding postoperative complications, scrotal edema was the most common complication (29.2%). Other early complications included seroma formation (8.3%), paralytic ileus (6.9%), superficial wound infection (5.6%), hematoma (1.4%), and leakage (1.4%). Only one patient had postoperative mortality (1.4%), one patient required hospital readmission (1.4%), and one patient required surgical intervention for peritonitis secondary to leakage from the anastomotic site (1.4%). Recurrence in 6 months postoperative was encountered in eight patients (11.1%)

Conclusion: The incidence of strangulation is 39.3% among patients presented with irreducible inguinal hernia. The prevalence of heavy manual work, diabetes mellitus was statistically significantly higher in the irreducible strangulated cases. No significant differences were detected between the mesh and anatomical repairs groups regarding postoperative complications.

Keywords: Strangulated inguinal hernia, Irreducible inguinal hernia, Modified Bassini repair, Lichtenstein.

INTRODUCTION

A protrusion of the abdominal tissues or organs that occurs as a result of a weakening in the muscular structure of the wall of the abdomen is referred to as an abdominal wall hernia. It is common practice to include both inguinal and femoral hernias under the umbrella term of groin hernias **(1).**

The gut that has been strangulated is more likely to develop necrosis, which may result in the perforation, rupture, and leakage of the contents of the colon, and ultimately, a destructive peritonitis. Most of the time, bowel or omentum are found inside ventral abdominal and inguinal hernias; the appendix is only found within the herniated area in very rare instances, and it is often discovered by accident **(2).**

Inguinal hernias can only be treated definitively by surgical procedures. When it comes to elective surgery, the placement of a synthetic implant is the therapy that is most often recommended. Despite this, it is nevertheless possible to encounter individuals in the course of routine clinical practice who are suffering from an incarcerated hernia as a result of either carelessness or delayed diagnosis **(3).**

The alternate one; the repair method developed by Bassini is simpler to learn, less expensive in terms of initial expenditures, and more frequently utilized in medical facilities. New ground was broken in the field of groin hernia repair with the introduction of the Lichtenstein tension-free repair. It has become the gold standard of groin hernia repair in terms of the rates of recurrence and the results that care for the patient **(4).**

Even in cases when intestinal resection is required, the polypropylene meshes may be employed in inguinal hernia surgery without causing any adverse effects. Polypropylene meshes were the sole ones that were used for the activities that were carried out in the material that was studied in several of the research. It is possible that this is the reason why there is such a low incidence of infectious problems and why it is not necessary to remove the meshes in the event that the wound becomes infection-ridden. There are also various short-term and long-term consequences that are associated with this, including sexual dysfunction, seroma, hematoma, and chronic discomfort. Wound healing issues, testicular hydrocoele, and spermatic cord cysts are also present **(5).**

This was a clinico-epidemiological study aiming to report our current practice in Mansoura for strangulated inguinal hernia to identify incidence, types, methods of repair and risk factors related to postoperative complications.

PATIENTS AND METHODS

This prospective observational research conducted for one-year duration from October 2020 to October 2021, on 183 patients of irreducible inguinal hernia who presented with irreducible inguinal hernia and they were admitted to Mansoura University Emergency Hospital and Mansoura International Hospital.

Received: 26/10/2023
Accepted: 26/12/2023

Inclusion criteria: Patients presented with irreducible inguinal hernia and age group more than 18 years.
Exclusion criteria: Patients presented with reducible inguinal hernia as they were referred for Outpatient Clinic (OPC) and patients less than 18 years as they were admitted in Mansoura University Children's Hospital.

METHODS

Surgical procedure

A supine position was adopted for the patient, and an incision was made at a level one inch above the inguinal ligament, reaching laterally from the pubic tubercle to the anterior superior iliac spine (ASIS). There was a dissection of the subcutaneous tissues, and an incision was made in the external oblique fascia in order to protect the ilio-inguinal and ilio-hypogastric nerves. Spermatic cord mobilization was accomplished by surrounding a cord structure at the pubic tubercle level with a finger. In order to clear the hernial sac to the level of the internal inguinal ring, it was first separated from the cord structures that were surrounding it. The hernia sac was examined for visceral contents and the decision was made between hot fomentation with reduction, omentectomy only, resection and anastomosis, or resection with stoma (Fig. 1). A midline incision was needed in some cases for resection and anastomosis or for diverting stoma in cases of peritonitis. The sac's neck was transfixed under vision at the level of the internal ring, and the sac was excised.

Figure 1: Left inguinal hernia with gangrenous loop in male patient.

In cases with redundant fascia transversalis, Vicryl 0 was used for fascia transversalis plication, followed by strengthening the posterior wall of the inguinal canal using a one of the following procedures:

Modified Bassini Repair procedure (Fig. 2):

The modified Bassini procedure, which was performed for 55 patients, was done by suturing the conjoined tendon of the transverses abdominus and the internal oblique muscles to the reflection of inguinal ligament with monofilament non-absorbable sutures [(6)]. Modified Bassini repair was indicated in the cases in which the turbid fluid found in the hernial sac, when the resection was done in perforated or non-viable intestine, in case of uncontrolled diabetes mellitus.

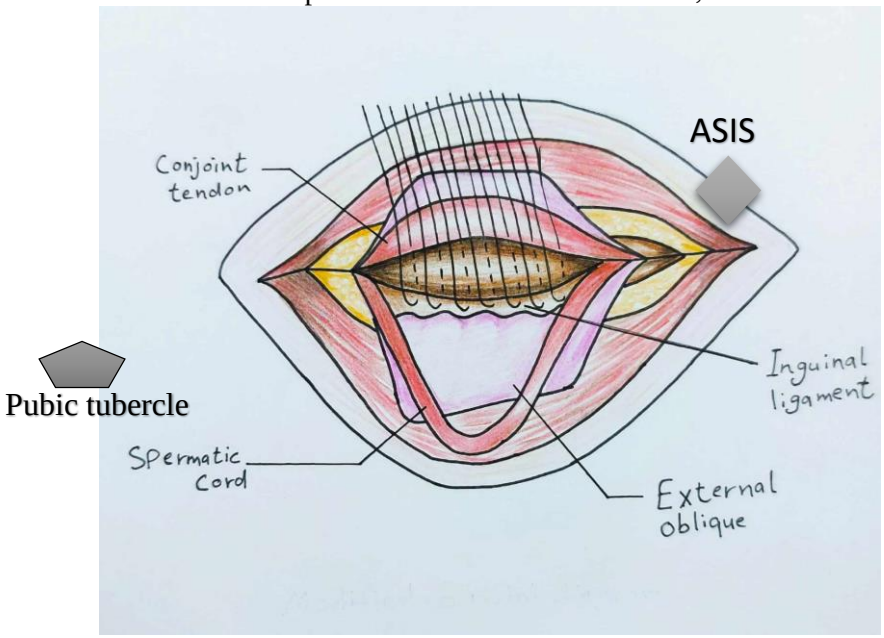

Figure 2: Diagram of modified Bassini procedure in left inguinal hernia

Lichtenstein (Tension free repair) procedure (Fig. 3):

Lichtenstein (Tension free repair) procedure, which was performed for 17 patients; a prosthetic mesh was stitched to the aponeurotic tissue that covers the pubic bone. The stitching continued along the sloping edge of the inguinal ligament to a location on the side of the internal inguinal ring using a 2.0 non-absorbable, single-strand suture. The mesh's lateral edge was incised to create an opening for the spermatic cord to pass through the divided sections of the mesh. The front border of the mesh was stitched to the conjoined tendon. The two ends of the mesh's lateral aspect were stitched together to form a new deep ring composed of mesh [(7)]. Tension-free repair (Mesh hernioplasty) was recommended for cases with clear fluid in the hernial sac, viable bowel, or controlled diabetic patients. It is not used for preoperative peritonitis or ischemic necrosis caused by strangulated inguinal hernia. After repairing the posterior inguinal canal, the spermatic cord was returned and the external oblique aponeurosis margins were secured with sutures. An intraperitoneal drain was inserted in the pelvis region for cases of anastomosis or doubty loop.

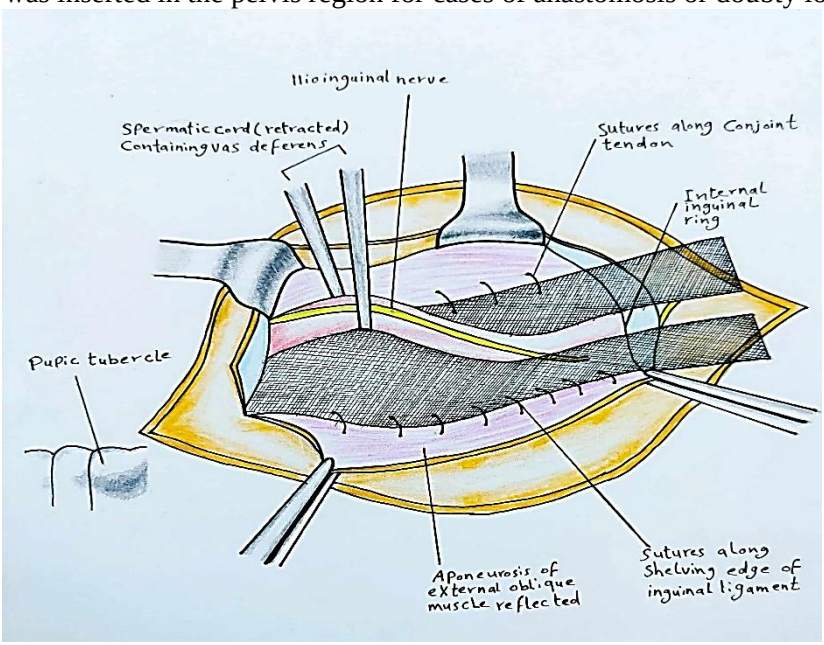

Figure 3: Diagram of Lichtenstein procedure in left inguinal hernia.

Postoperative follow-up

Patients were followed up postoperatively during hospital admission, if there was admission in ICU, vital signs, paralytic ileus, postoperative seroma, hematoma, scrotal edema, time of drain removal, leakage in cases with intestinal resection anastomosis, wound infection, length of hospital stays and 30 days' postoperative mortalities were reported. After patients' discharge regular follow up visits were arranged weekly in the 1st month postoperatively and then monthly for the next 6 months. Recurrence in 6 months after surgical intervention was recorded.

Ethical Considerations:

This study was ethically approved by Department of General Surgery and Endocrine Surgery, Mansoura University, Egypt, and the Research Ethics Committee of the Faculty of Medicine, Mansoura University (IRB Code Number: MS 20.07.1189). Written informed consent of all the participants was obtained. The study protocol conformed to the Helsinki Declaration, the ethical norm of the World Medical Association for human testing.

Statistical Analysis

Recorded data were analyzed using the statistical package for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA).

The quantitative data were presented as mean± standard deviation. Also, qualitative variables were presented as number and percentages. Comparison of quantitative variables was done using Mann Whitney U test for non-normally distributed data. Categorical data are expressed as number (%). The p-value was considered significant as the following: P-value <0.05 was considered significant, P-value <0.001 was considered as highly significant, P-value >0.05 was considered insignificant.

RESULTS

This study was performed in Mansoura University Hospital and Mansoura International Hospital in the period from October 2020 to October 2021 and revealed that 183 patients of irreducible inguinal hernia were presented to the two referral hospitals in Mansoura city.

Successful trials of reduction with fomentation were done for 60 patients in Emergency Room and Surgery Department then referred them to outpatient clinic for hernioplasty. The other 123 patients went for emergent open surgery which revealed that non-strangulated viable contents were found in 51 patients and strangulated query viable contents were found in 72 patients.

The incidence of strangulated hernia among all irreducible hernia cases presented during the study period was 39.3% (Figure 1).

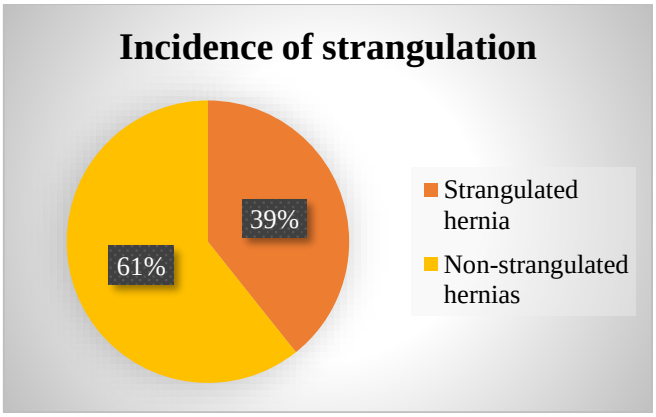

Figure 1: Incidence of strangulation (72 cases) among patients presented with irreducible hernias (183 cases) in our study.

Age, gender and residency were not statistically significant factors that differentiated the categories from one another, as well as BMI, smoking, HTN, liver diseases, renal diseases. There was statistically significant difference as regard occupation and diabetes mellitus (Table 1).

Table 1: Analysis of the demographic and clinical data in the two study groups.

	Groups				P value
	Irreducible strangulated (N= 72)		Irreducible non-strangulated (N= 111)		
Age (Years)	48.61 ± 8.68		47.70 ± 9.37		P= 0.51
Gender					
Males	69	95.8	110	99.1%	
Females	3	4.2	1	0.9 %	P = 0.139
BMI (Kg/m^2)	31.61 ± 3.98		31.23 ± 2.77		P= 0.447
Residence					
Urban	22	30.6	39	35.1 %	P = 0.521
Rural	50	69.4	72	64.9 %	
Occupation					
Engineer	4	5.6	3	2.7 %	**P = 0.035***
Farmer	34	47.2	54	48.6 %	
Housewife	3	4.2	1	0.9%	
Teacher	7	9.7	2	1.8%	
Worker	24	33.3	51	45.9%	
ASA classification					
ASA I	21	29.2	34	30.6%	P = 0.952
ASA II	50	69.4	75	67.6%	
ASA III	1	1.4	2	1.8%	
Smoking	**25**	**34.7**	43	38.7%	P = 0.489
DM	12	16.7	2	1.8%	**P <0.001***
HTN	14	19.4	17	15.3 %	P = 0.467
Liver diseases	5	6.9	8	7.2%	P = 0.944
Renal diseases	1	1.4	3	2.7%	P= 0.552

Continuous data are expressed as mean ± SD, Categorical data are expressed as number (%), *: Statistically significant. ASA classification: American Society of Anesthesiologists Classification, DM: Diabetes mellitus, HTN: Hypertension, BMI: Body mass index

During the surgical procedure, the most common content of the hernial sac was combined omentum and small bowel in 36 patients (19 of them were non-viable) (Table 2).

Table 2: Contents of hernial sac and assessment of viability in strangulated inguinal hernia intraoperative.

Contents of hernial sac	Number of patients	Viable	Non-viable
Omentum and small bowel	36 (50%)	17 (47.2%)	19 (52.8%)
Omentum	21 (29.17%)	0 (0%)	21 (100%)
Sigmoid	4 (5.56%)	3 (75%)	1 (25%)
Small bowel	10 (13.89%)	5 (50%)	5 (50%)
Small intestine and appendix	1 (1.39%)	0 (0%)	1 (100%)

The mean duration of the surgical procedure was 84.07 minutes. The performed surgical procedures included resection anastomosis of small bowel occurred in 25 patients (34.7%) and hot fomentation with reduction occurred in 24 patients (33.3%). As regard the type of repair, anatomical repair (Modified Bassini repair) was performed in most of the patients (Table 3).

Table 3: Operative details in strangulated inguinal hernias in the cases of the study.

Variables	Study cases (N = 72)	
Procedure	**N**	**%**
Hot fomentation with reduction	24	33.3
Omentectomy	21	29.2
Resection of sigmoid with colostomy	1	1.4
Appendectomy and hot fomentation with reduction of the small bowel	1	1.4
Resection and anastomosis	25	34.7
Operative time (Mean ± SD)	**84.07 ± 2.56**	
Type of repair	**N**	**%**
Anatomical repair (non-mesh) (Modified Bassini)	55	76.4
Herniorrhaphy with mesh fixation repair	17	23.6

ICU admission was required in only two patients (2.8%), the duration of hospitalization ranged between 3 and 7 days. Regarding postoperative complications, scrotal edema was the most common complication (29.2%). Only one patient had postoperative mortality, one patient required hospital readmission, and one patient required surgical intervention for peritonitis secondary to leakage from the anastomotic site. Recurrence in 6 months postoperatively was encountered in eight patients (Table 4).

Table 4: Postoperative outcome and complications in strangulated inguinal hernias.

Variables	Study cases (N = 72)	
ICU admission	**N**	**%**
No	70	97.2
Yes	2	2.8
Hospital stay (Median (Range))	**3 (3-7)**	
Hospital stay	**N**	**%**
≤ 3 days	41	56.9
More than 3 days	31	43.1
Time to drain removal (Median (Range))	**8 (3-18)**	
Complications	**N**	**%**
Superficial wound infection	4	5.6
Hematoma	1	1.4
Seroma	6	8.3
Mortality	1	1.4
Recurrence	8	11.1
Scrotal edema	21	29.2
Paralytic ileus	5	6.9
Readmission	1	1.4
Leakage	1	1.4
Reoperation	1	1.4

ICU: Intensive care units

There was no significant difference amongst the mesh and non-mesh patients regarding either preoperative and postoperative data, including the occurrence of postoperative complications, while there was significant difference amongst the mesh and non-mesh patients regarding operative time (Table 5).

Table 5: Comparison between mesh and non-mesh group among cases with strangulated inguinal hernias.

	Mesh repair (n = 17)	Anatomical (non-mesh repair) (n = 55)	P value
Age (years)	41 (23 – 70)	46 (25 – 70)	0.168
Gender			
Male	17 (100%)	52 (94.4%)	0.325
Female	0 (0%)	3 (5.5%)	
DM	2 (11.8%)	10 (18.2%)	0.535
HTN	3 (17.6%)	11 (20%)	0.83
Duration of hernia	5 (3 – 7)	5 (2 – 7)	0.718
Type of hernia (Indirect inguinal)	17 (100%)	55 (100%)	1
Previous repair	2 (11.8%)	4 (7.3%)	0.558
Side of hernia			
Right	8 (47.1%)	35 (63.6%)	0.223
Left	9 (52.9%)	20 (36.4%)	
Operative time	82.87 ± 1.16	86.31 ± 2.04	<0.001*
Postoperative hospital stay	3 (3– 7)	4 (4– 8)	0.174
Superficial wound infection	1 (5.9%)	3 (5.5%)	0.944
Hematoma	0 (0%)	1 (1.8%)	0.575
Seroma	1 (5.9%)	5 (9.1%)	0.676
Mortality	0 (0%)	1 (1.8%)	0.575
Recurrence	1 (5.9%)	7 (12.7%)	0.433
Scrotal edema	4 (23.5%)	17 (30.9%)	0.559
Paralytic ileus	1 (5.9%)	4 (7.3%)	0.843
Readmission	0 (0%)	1 (1.8%)	0.575
Leakage	0 (0%)	1 (1.8%)	0.575
Reoperation	0 (0%)	1 (1.8%)	0.575

Continuous data are expressed as mean±SD and median (range), Categorical data are expressed as number (%), *: Statistically significant.

DISCUSSION

The incidence of strangulated hernia was 39.3% among the hernia cases presented with incarceration. Our incidence of strangulation is near to the incidence reported in the literature that ranges between 5% to 15% [8]. The mean age of the included cases was 48.61 years, which is near to the mean age reported by **Ahmad *et al.*** [9], which was 50 ± 21.3 years.

In the current research, the majority of the included patient were men (95.8%) of the study participants, whereas women were (4.2%). This is accordance with **Barry *et al.*** [10] who reported that the majority of their participants with strangulated inguinal hernias were men, who represented 98% of the study population.

In the current study, operative findings revealed that half of the included patients had combined omentum and small bowel in their sacs (19 of them were non-viable). Additionally, only omentum was detected in 29.17% of cases (All were non-viable), while only small bowel was detected in 13.89% of cases (5 of them were non-viable). Other contents included the sigmoid colon (5.56%) and combined small bowel with the appendix (1.38%).

Ahmad *et al.* [9] reported that hernial sac contents were as follows; ileum (46%), omentum (24%), ileum with omentum (16%), colon (6%), colon with omentum (4%), and appendix (4%).

In our study, the performed surgical procedures included resection anastomosis (34.7%), hot fomentation with reduction (33.3%), omentectomy (29.2%), colostomy (1.4%), and appendectomy with hot fomentation (1.4%). **Ahmad *et al.*** [9] reported that the operative procedures performed for strangulated hernias were as follows: Anatomical darn repair (78%), ileal resection and anastomosis (32%), partial omentectomy (26%), obliteration of the inguinal canal (12%), Bassini repair (10%), and orchidectomy (6%).

In the current study, anatomical repair (non-mesh) was performed in 55 patients (76.4% of cases), whereas mesh repair was done for the remaining 17 patients (23.6% of cases). In contrast to our findings, **Dai *et al.*** [11] reported higher need for mesh-based repair in their study, as it was applied in 67.2% of the study cases, whereas the remaining cases (32.8%) underwent traditional herniorrhaphy.

IN the current research, the mean period of the surgery was 84.07 minutes. **Mahmoud** [12] reported that the mean time of operation was 110 minutes in individuals who did not need bowel resection, and that period increased to 170 minutes in individuals with bowel resection. In the current research, the duration of hospitalization ranged between 3 and 7 days, and most patients had a hospitalization period of three days (56.9%). **Abdelrahman *et al*.** [13] reported that the

duration of hospitalization extended between 2 and 8 days (mean = 3.7), which is near to our findings.

Regarding postoperative complications, scrotal edema was the most common complication (29.2%). Other early complications included seroma formation (8.3%), paralytic ileus (6.9%), superficial wound infection (5.6%), hematoma (1.4%), and leakage (1.4%). Only one patient had postoperative mortality (1.4%), one patient required hospital readmission (1.4%), and one patient required reoperation (1.4%). Recurrence was encountered in eight patients (11.1%).

Chukwubuike [(14)] reported an incidence of 26% for scrotal edema, which was the most common complication after inguinal hernia repair. **Lebeau *et al*.** [(15)] reported an incidence rate of 2.78% for postoperative hematoma. Also, they confirmed the low incidence of the intestinal leakage after emergency operations for strangulated inguinal hernia (2 out of 288 patients – p = 0.69%). **McCarthy *et al*.** [(16)] recorded the potential occurrence of postoperative ileus subsequent to significant abdominal surgery, encompassing gastrointestinal and other intra-abdominal procedures. The reported incidence rate falls within the range of ten to thirty percent. Also, our finding is consistent with prior research that documented a high incidence of 8–22% for scrotal hematomas following surgical procedures, which is believed to be the consequence of extensive sac separation in long and huge indirect inguinal hernias [(17)].

Alvarez *et al*. [(18)] presented a range of mortality rates for strangulated groin hernias, with values between 0.4 percent and eleven percent. Our mortality incidence lies within the previously reported range.

In our study, it was not possible to discern any substantial differences among the mesh and non-mesh patients, regarding either preoperative, intraoperative, and postoperative data, including the incidence of postoperative complications ($p > 0.05$). In line with our findings, **Tomaoglu and Okmen** [(19)] reported that no substantial variation was identified in terms of postoperative complications among the mesh- and anatomical repair groups in their 301 patients presented with strangulated groin hernias.

CONCLUSION

The incidence of strangulation was 39.3% among patients presented with irreducible inguinal hernia. The prevalence of heavy manual work (framers and workers) was statistically significantly higher in the irreducible strangulated cases. Also, the prevalence of DM was statistically significantly higher in the irreducible strangulated cases. Additionally, no significant differences were detected between the mesh and anatomical repairs groups regarding postoperative variables.

DECLARATIONS

- **Consent for publication:** I certify that each author has granted permission for the work to be submitted.
- **Funding:** No fund
- **Availability of data and material:** Available
- **Conflicts of interest:** No conflicts of interest.
- **Competing interests:** None

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