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Case report

Laparoscopic no-mesh repair of a large Morgagni-Larrey hernia

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Abstract

Morgagni-Larrey hernia is a rare condition, often presenting with nonspecific symptoms or remaining asymptomatic. Surgical intervention is the primary treatment modality, typically performed via trans-abdominal access, with an increasing trend towards employing minimally invasive techniques.

Herein, we report a case detailing the successful laparoscopic repair of a large Morgagni-Larrey hernia without the use of mesh. The patient, a 55-year-old male, presented with chest pain following blunt thoraco-abdominal trauma. Chest radiographs and 3D-CT scan revealed a dense mass in the precordial space, initially suspected to be a diaphragmatic rupture. The diaphragmatic defect which was repaired laparoscopically, appeared to be a large Morgagni-Larrey hernia rather than a rupture.

At the two-year follow-up, a repeat 3D-CT and laparoscopy were conducted to assess the previous repair and address a port site (drain site) hernia. No intra- or postoperative complications were encountered.

Our experience supports the safety and efficacy of the laparoscopic no-mesh technique for repairing large Morgagni-Larrey hernias.

Keywords

Diaphragmatic hernia, Hernia, Laparoscopy, Morgagni-Larrey, No-mesh

Background

The Morgagni type of hernias arises from a rare congenital defect located in the retrosternal segment of the diaphragm, characterized by a weakness in the diaphragmatic fibers between its costal and sternal portions. It accounts for only 2–3 % of all congenital diaphragmatic hernias [1, 2]. When the defect occurs to the right side of the sternum, it is termed Morgagni's hernia or right Morgagni's hernia, while on the left side, it is referred to as Larrey's hernia or left Morgagni hernia [3]. Bilateral defects involving both sides of the sternum are labeled as bilateral Morgagni hernia or Morgagni-Larrey hernia.

Clinical presentation does not significantly differ among these hernia types. Typically, the defect size is small, with a transverse diameter greater than the antero-posterior diameter [4]. The hernial sac commonly contains omentum (31 %), followed by the large intestine (29 %), stomach (15 %), small intestine (11 %) and liver (4 %) [5].

Traditional surgical management typically involves either trans-thoracic or trans-abdominal approaches, focusing on suturing the diaphragmatic edge to the endothoracic fascia covering the inner aspect of the sternum and ribs [6]. Laparoscopic repair was first reported in 1992 by Kuster et al. [7].

Case presentation

A 55 year-old male patient was admitted to our surgical department complaining of chest pain radiating to the back and lower third of the sternum following thoraco-abdominal trauma. The patient had fallen from a tree approximately 24 hours prior and had no history of previous trauma. He was otherwise healthy, with no known concomitant diseases. Clinical examination revealed no remarkable findings, with physiologic bowel sounds and hematological and biochemical analyses within normal limits.

Lateral and anterior chest radiographs revealed a prominent soft-tissue density shadow with smooth, well-defined margins situated in the precordial space. CT imaging demonstrated signs indicative of dependent viscera, including diaphragmatic discontinuity, herniation of abdominal viscera and omentum, and a waist-like constriction of the herniated transverse colon within both the left and right chest cavities, as well as the anterior-lower mediastinum. The measured dimensions of the diaphragmatic defect were 91.5 mm x 42.3 mm; totaling 39.1 cm^2 (Fig. 1). These findings, in conjunction with the history of trauma, strongly indicated a diaphragmatic rupture. Three dimensional rendering of the CT data further illustrated that nearly the entire transverse colon was located within the lower anterior mediastinum (Fig. 2).

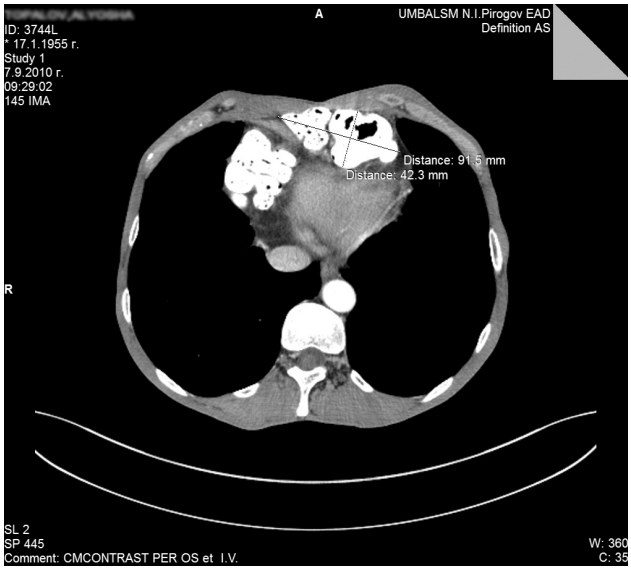

Figure 1. Preoperative axial computed tomography (CT) scan demonstrating diaphragmatic defect containing herniated into the thorax intestinal loops and mesenteric tissue.

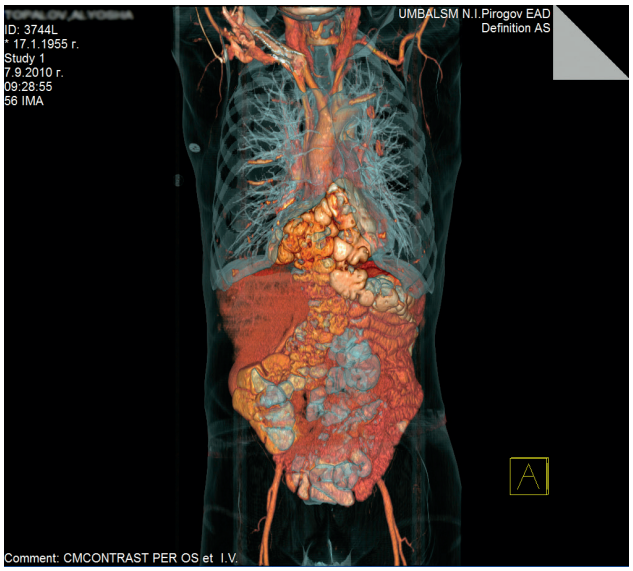

Figure 2. Preoperative three-dimensional computed tomography (3D-CT) showing a large Morgagni-Larrey hernia.

Following preoperative evaluation and single-lumen intubation, laparoscopy was performed utilizing five ports (two 10 mm and three 5 mm). Intra-operatively, confirmation of an anterior diaphragmatic Morgagni-Larrey hernia containing transverse colon, omentum and small intestine, was made (Fig. 3).

Laparoscopic excision of the sac proceeded by dissecting the plane between the peritoneal sac and the pleura, which was easily mobilized without pleural injury. The diaphragmatic defect was meticulously repaired in two layers using braided non-absorbable sutures #1. The initial layer consisted of interrupted mattress sutures, passing through 5 mm skin incisions, traversing the entire thickness of the anterior abdominal wall , and then through the diaphragm (Fig. 4a–c). Subsequently, all sutures were simultaneously drawn and tied, with the knots secured in the subcutaneous space. The second layer was executed with a running suture. A single 18 Fr tube drain was inserted through the left subcostal 10 mm port. The drain was removed on postoperative day 2. The total operating time was 135 minutes. The patient experienced an uneventful postoperative course and was discharged on the third day following surgery.

Twenty-five months after the operation, the patient presented with a 10 mm port site hernia (Fig. 5a–c), which was asymptomatic.

Imaging studies were conducted to assess the integrity of the previous diaphragmatic hernioplasty. CT and 3D-CT scans revealed the absence of a diaphragmatic defect, with the hernioplasty appearing intact (Fig. 6a, b).

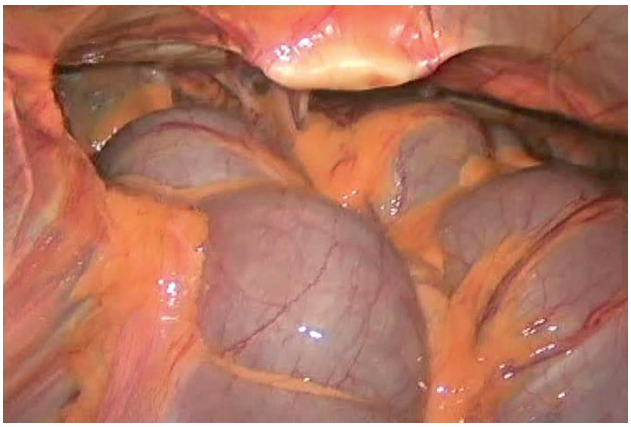

Figure 3. Laparoscopic view of large Morgagni-Larrey hernia showing herniated into the chest colon and omentum.

Subsequently, three-port laparoscopy was performed to address the port site hernia and evaluate the outcomes of the previous surgery. The procedure confirmed the integrity of the hernia repair (Fig. 6c); with a few peritoneal adhesions noted in the upper abdominal cavity.

The 10 mm port site hernia, where the omentum was tightly adhered to the hernia sac, was identified (Fig 5c) and repaired accordingly. No drain was utilized, and the operating time was 30 minutes. The patient's postoperative course was uncomplicated, and discharge was facilitated on the first postoperative day.

Discussion

Hernia of the right anterior aspect of the diaphragm between its costal and sternal portions was initially described in 1761 by Giovanni Battista Morgagni. He characterized this anomaly as a triangular space delimited by the musculoaponeurotic fibers of the diaphragm [8].

The left-sided defect is called the space of Larrey, after Napoleon's surgeon who described it as an access route for the management of pericardial tamponade [9].

We opted to accept the less popular term Morgagni-Larrey for bilateral Morgagni's hernia, recognizing its informative nature facilitating a clear visual comprehension.

Congenital diaphragmatic defects are exceedingly rare, occurring at a frequency of 1 in 2000 to 1 in 5000 births, with Morgagni hernia constituting only 3 to 5% of these cases [1]. Predominantly, right-sided parasternal localization prevails, accounting for 91 %, followed by left-sided (5 %) and bilateral (4 %) occurrences . The Mean age at diagnosis is 53 years [5], with 59 % of all patients being older than 50 [10].

Contrary to common beliefs, analysis by Horton et al. refutes the notion of asymptomatic presentation, as 72 % of patients exhibit symptoms. The most prevalent manifestations include chest and abdominal pain or pressure (37 %), pulmonary symptoms such as cough and dyspnea (36 %), and intestinal obstruction (20 %) [5]. In rare instances, patients may present with acute symptoms indicative of bowel or stomach strangulation, necessitating emergency surgical intervention [11, 12]. Predisposing factors reported in the literature encompass trauma, pregnancy, obesity, chronic cough, and constipation [13, 14, 15]. Herniation through the foramen of Morgagni has been reported subsequent to acute pancreatitis, attributed to heightened intra-abdominal pressure [14].

The correlation between the presence of symptoms and hernia size remains a subject of debate. Slaetis's findings did not establish a significant correlation [16], while Sirmali suggested that defects smaller than 5x5 cm are typically asymptomatic [17]. Conversely, Horton et al. reported instances where small-sized hernias induced symptoms [5]. In our case, the patient reported experiencing intermittent nonspecific symptoms, including nausea, obstipation and mild chest discomfort, albeit on rare occasions.

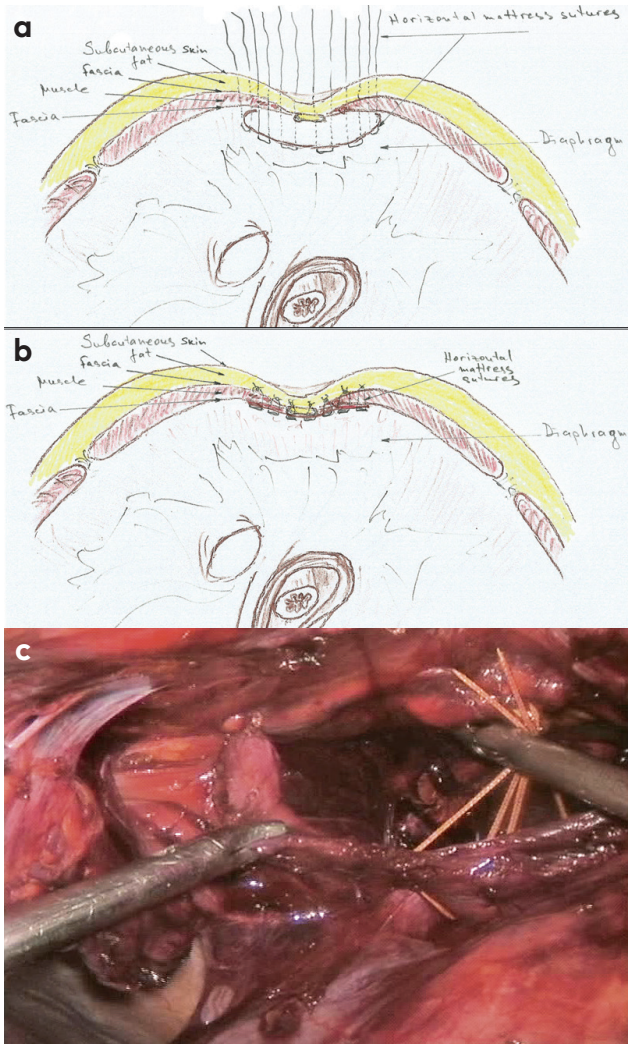

Figure 4. (**a**) The diaphragmatic defect is repaired by interrupted mattress sutures passing through 5 mm skin incisions and through the whole thickness of the anterior abdominal wall and then through the diaphragm. (**b**) The sutures are pulled up together and tied, the knots secured in the subcutaneous space. (**c**) The diaphragmatic defect is repaired by interrupted mattress sutures - laparoscopic view.

According to a literature review conducted by Horton et al., the most common diagnostic modalities employed for evaluating patients with Morgagni hernia include plain chest X-ray (utilized in 93% of cases), followed by computed tomography (CT) scan (47 %), contrast enema (24%), upper gastrointestinal study (23%), upper gastrointestinal endoscopy (8%) and magnetic resonance imaging (5%) [5]. Notably, a lateral chest radiograph typically offers sufficient information for diagnosis [18], with the first radiologic diagnosis of Morgagni hernia recorded in 1911 [19]. Radiographic findings commonly reveal a dense mass in the cardiophrenic angle or retrosternal space, with air-fluid levels indicating herniation of hollow viscera [20]. Confirmation of diagnosis often involves subsequent CT imaging, which can delineate dense masses or bowel loops within the thoracic cavity.

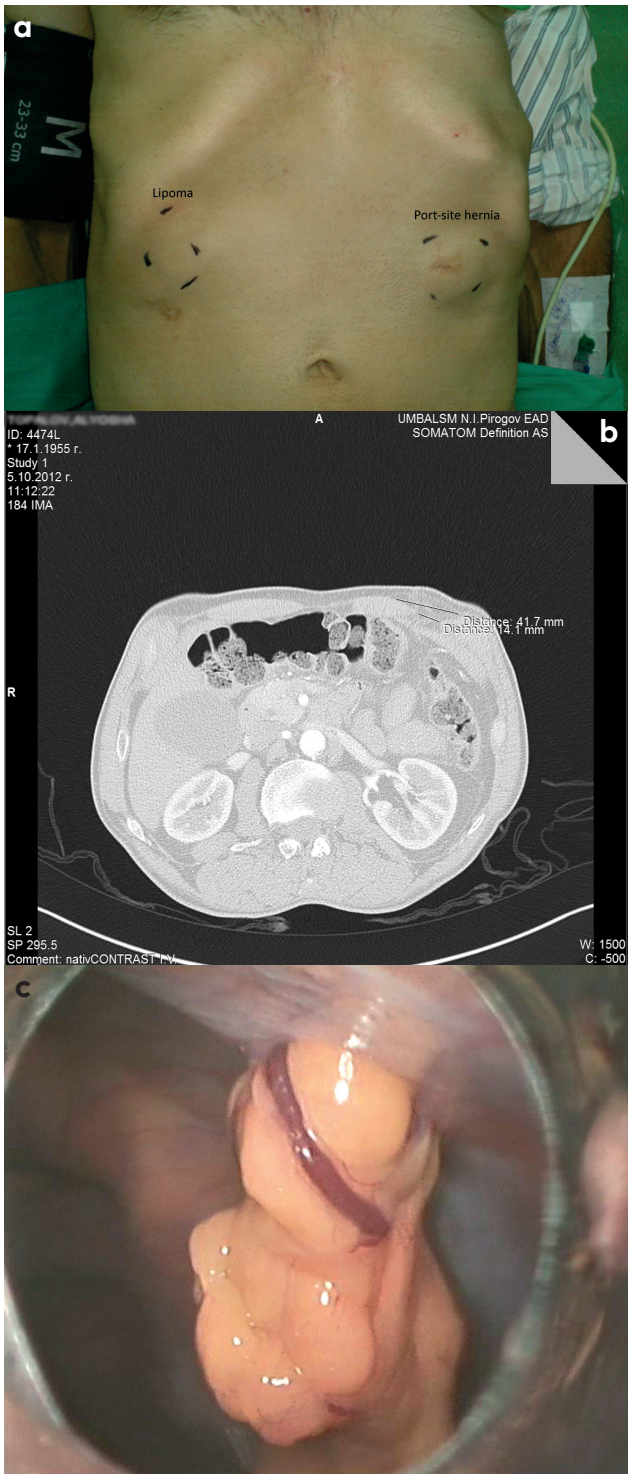

Figure 5. (**a**) Follow-up visit at 25 month. Postoperative port (drain) site hernia. (**b**) Follow-up visit at 25 month. CT scan demonstrating a port (drain) site hernia containing omentum. (**c**) Laparoscopic view of the postoperative drain site hernia containing omentum.

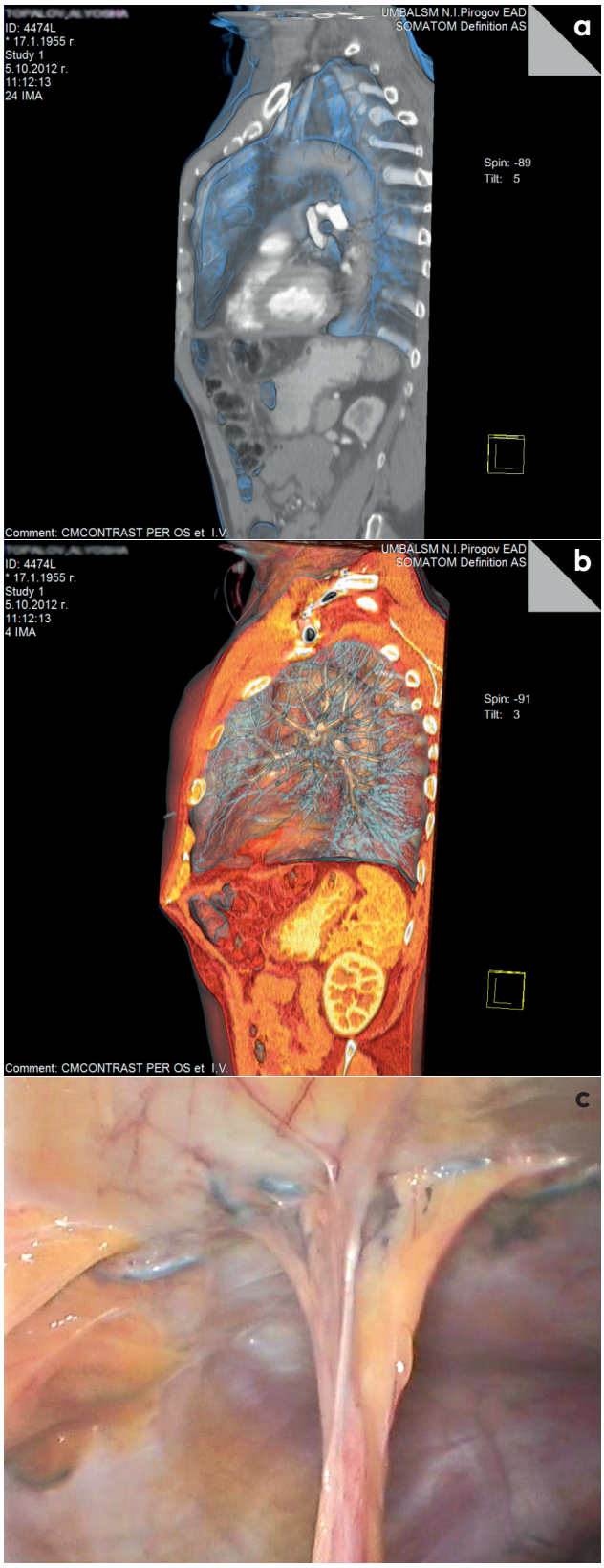

Figure 6. (**a, b**) Three-dimensional computed tomography performed 25 months after the operation demonstrating an intact hernioplasty. (**c**) Laparoscopic view 25 months after the operation demonstrating intact hernioplasty and a few peritoneal adhesions.

In our case, although the initial plain X-ray provided accurate and informative results, considering the patient's history of trauma, we opted to perform a chest and abdominal CT scan to confirm the diagnosis. Additionally, we utilized

three-dimensional rendering of the CT data (3D-CT) both preoperatively and during the 25-month postoperative follow-up. These 3D imaging studies proved valuable, offering precise delineation of the herniated viscera and aiding in decision-making before surgery. Moreover, during the follow-up visit, 3D-CT provided similarly decisive insights into the status of the hernioplasty.

Surgery represents the sole definitive treatment for Morgagni hernia, serving to prevent intra-abdominal organs from protruding into the thoracic cavity. Repair of the defect can be accomplished through either a trans-thoracic or trans-abdominal approach. Conventional methods, such as thoracotomy and laparotomy were prevalent in early publication, but in more recently published case reports, most of the patients underwent minimally –invasive, trans-abdominal approach.

Our own experience contributes one case to this literature, demonstrating successful repair of a right Morgagni's hernia utilizing right VATS [21].

The trans-thoracic approach offers distinct advantages, including enhanced exposure of the hernia sac, facilitating safer dissection of pericardial and pleural adhesions, particularly beneficial for right-sided Morgagni hernias [22]. Additionally, direct visual control facilitates easier access to the posterior part of the sternum and the diaphragmatic edge [21, 23]. Conversely, the trans-abdominal approach provides benefits such as easier reduction of the herniated contents and the capacity to assess and repair bilateral defects. In emergent scenarios, this procedures is typically conducted by general surgeons [7]. Moreover, the laparoscopic approach presents the opportunity for entirely minimally invasive repair. Based on our experience, we consider the laparoscopic approach to be the optimal treatment modality bilateral Morgagni hernias.

Prosthetic mesh is predominantly utilized during laparoscopic repair (64 %), followed by thoracotomy (8 %) and laparotomy (6 %) procedures [7]. To mitigate tension along the suture line, Thoman et al. advocated for mesh placement in defects larger than 20–30 cm^2 [24].

During our patient's procedure, we encountered numerous adhesions between the sac and viscera. Utilizing laparoscopic access, adhesiolysis was safely performed under direct visualization. Despite the sizable diaphragmatic defect (measuring 91.5 mm x 42.3 mm; 39.1 cm^2, repair was accomplished through direct suturing with mattress sutures, obviating the necessity for prosthetic mesh placement.

Many authors suggest that for large Morgagni-type diaphragmatic defects, a tension-free mesh technique is recommended, although scientific evidence supporting this approach remains lacking [6, 21, 24, 25]. Our case details a successful hernioplasty of a large Morgagni-Larrey hernia without the use of mesh, with a follow-up period of 25 months. This single case provides grounds to hypothesize that for this specific type of hernias, a no-mesh repair may be reliable, even for large diaphragmatic defects.

Conclusion

Minimally invasive surgery emerges is a feasible treatment option for Morgagni-Larrey hernias of any size. Through meticulous dissection along the appropriate anatomical planes, the hernial sac can be readily peeled, isolated and excised. Laparoscopic no-mesh hernia repair of the diaphragm, utilizing mattress sutures passing through the entire thickness of the abdominal wall, represents a swift, safe and reliable surgical technique, even for addressing large Morgagni-Larrey hernias.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statements

The authors declared that no clinical trials were used in the present study.
The authors declared that no experiments on humans or human tissues were performed for the present study.
Informed consent from the humans, donors or donors' representatives: Pirogov University Hospital
The authors declared that no experiments on animals were performed for the present study.
The authors declared that no commercially available immortalised human and animal cell lines were used in the present study.

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Author contributions

All authors have contributed equally.

Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

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