



## Full Length Research Article

# Greater Omentum without Torsion and Ileum with Mesentery as a content of Oblique Inguino-Scrotal Hernia- A Cadaveric case study

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### ABSTRACT

A hernia is defined as the protrusion of a viscus or part of a viscus through the walls of its containing cavity. The inguinal canal is a common site of herniation since it is a weakness in the anterior abdominal wall. A hernia in the inguinal region is known as inguinal hernia. Inguinal hernias are of two types- Oblique or indirect and direct. Studies have reflected that hernia is a degenerative disease and this has been shown on the basis of study of the histological studies of the tissues of the inguinal canal. In the present study, we discuss a rare exposure of an untreated indirect or oblique inguinal hernia in about a 60 year old male formalin fixed cadaver noticed during routine dissection of the abdomen for the first MBBS students in Late Shri Lakhiram Agrawal Memorial Medical College, Raigarh (CG). Even though inguinal hernia is a common benign finding, surgical exposure and reduction is a challenge for the laparoscopic surgeons. Present paper concentrates on the content of the hernia, and also on the morphological and structural adjustments occurring within the abdomino-pelvic cavity to accommodate a long standing, non-strangulated and untreated inguinal hernia so as to make the surgeons aware and conscious and to prevent iatrogenic complications.

**Key words:** Indirect inguinal hernia, Oblique hernia, Greater omentum, Torsion Inguinoscrotal hernia.

### INTRODUCTION

Protrusion of any viscus, covered by a peritoneal sac through the inguinal region due to any weakness within anterior abdominal wall is known as inguinal hernia (Sofia Anagnostopoulou *et al.*, 2006). Anatomically, inguinal hernia is principally of two types- oblique or indirect and direct. (Neeta V Kulkarni, 2014) Indirect inguinal hernia may be further sub classified as medial and lateral depending upon its anatomical relation with inferior epigastric artery. The direct or indirect inguinal hernia also may be complete and incomplete depending upon whether it reaches or not to the scrotum. (Neeta V Kulkarni, 2014) The content of the hernia sac may include a piece of omentum, parts of small or large intestine; ileum (commonest) and rarely, ovary, fallopian tube, urinary bladder, incarcerated bladder diverticula, large bowel diverticula with the form of diverticulitis or abscess, stomach, Meckel's diverticulum (Litre hernia), foreign bodies (fish bones) (Williams *et al.*, 1995; Sofia Anagnostopoulou *et al.*, 2006). On the right side, Caecum, appendix (Amyand's hernia to honor Claudius Amyand, surgeon to King George II), ascending colon and on the left sigmoid colon (Brunnicardi Charles, 2005; Sofia Anagnostopoulou *et al.*, 2006) may also be involved. The inguinal canal is formed in the lower part of the anterior abdominal wall due to the descent of the gubernaculum of the testis or ovary (Gonads). A peritoneal fold known as the 'processus vaginalis' protrudes down the

inguinal canal along the antero-superior aspect of the gubernaculum testis (Neeta V Kulkarni, 2014) (Asim Kumar Dutta, ?). The gubernaculum testis is a fibrous strand that extends from the lower pole of the developing gonads to the labio-scrotal swelling (future site of scrotum or labium majus) during the fourth of intra-uterine life which pulls the gonads downwards (Neeta V Kulkarni, 2014) (Asim Kumar Dutta, 2008). The processus vaginalis follows the course of the gubernaculum (Neeta V Kulkarni, 2014). The canal is about 4cm long with two ends-superficial and deep inguinal rings. Medial to the deep ring, the inferior epigastric vessels lie along the posterior wall of the canal. The superficial inguinal ring is a triangular aperture in the aponeurosis of external oblique muscle (Neeta V Kulkarni, 2014), lying just above and lateral to the pubic crest (Williams *et al.*, 1995), (Neeta V Kulkarni, 2014).

The deep inguinal ring is U shaped gap or a circular gap (Neeta V Kulkarni, 2014) in the condensed fascia transversalis and situated 1.25cm above the mid inguinal point (Russel *et al.*, 2000; Snell, 2008) (Neeta V Kulkarni, 2014). Indirect inguinal hernia is the commonest type (Williams *et al.*, 1995) and congenital in nature due to persistence of the processus vaginalis (Russel *et al.*, 2000), (Neeta V Kulkarni, 2014). The sac passes down the canal on the outer aspect of the spermatic cord, with the neck passing through the deep inguinal ring lateral to the inferior epigastric vessels. In the direct variety, herniation occurs through the posterior wall and through the Hesselbach's inguinal triangle (Sinnatamby, 1999) (Neeta V Kulkarni, 2014) and is always acquired in nature (Neeta V

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Kulkarni, 2014). The sac protrudes outside and posterior to the spermatic cord and the neck lies medial to the inferior epigastric vessels (Williams *et al.*, 1995). Associated straining factors are like chronic cough, constipation, heavy weight lifting, usually in older age group in whom the tone of muscle is less (Neeta V Kulkarni, 2014). The inguinal hernia usually presents as swelling in the inguinal region or groin which increases in size on coughing. It is possible to reduce the swelling by pushing it upwards or the swelling may automatically disappear in supine position (Neeta V Kulkarni, 2014). Ring occlusion test may be performed to differentiate direct from indirect inguinal hernia (Neeta V Kulkarni, 2014).

Herniorrhaphy is the usual surgical procedure followed for hernia repair, where the surgeon repairs the defect by sewing surrounding muscle together or by placing a “mesh” over the defect. Laparoscopic hernia repair is the newer technique followed as it has advantages of less postoperative pain and recovery time than open surgery (Sarabjit Singh *et al.*, 2014). Complications like recurrences after mesh repairs and inguinodynia are observed in patients. Polypropylene mesh induced inflammation and fibrosis leading to formation of scar like tissue with involvement of the vas, vessels of the spermatic cord and nerves in the inguinal canal are becoming a cause of concern as these can lead to complications like - abnormal fertility, ischemic orchitis and neuralgias. A physiologically dynamic and strong posterior inguinal wall and the shielding and compression action of the muscles and aponeurosis around the inguinal canal are important factors that prevent hernia formation or recurrence after repair (Neeta V Kulkarni, 2014), (Sarabjit Singh *et al.*, 2014). In addition, the squeezing and plugging action of the cremasteric muscle and binding effect of the strong cremasteric fascia plays an important role in the prevention of hernia (Sarabjit Singh *et al.*, 2014).

### Background and review of literature

Oblique inguinal hernias are commonly encountered clinical condition in day to day practice (Fitzgibbons *et al.*, 2006). Hernia with congenital background can occur soon after birth or may be evident at latter stages of life (Valioulis *et al.*, 1997). Though extensive literature is available concerning inguinal hernia, present report adds to the literature by concentrating on the structural deformation, morphological changes that may occur in the abdomino-pelvic cavity due to mal-positioning of intestinal loops (Allwyn Joshua *et al.*, 2014) in a long standing inguinal hernia. Inguinal hernia in females is relatively uncommon as compared to males. It is interesting to note that 1 male in 5 and 1 female in 50 will eventually develop inguinal hernia in a lifetime. The incidence of inguinal hernia in females is 1.9%, the ratio of boys to that of girls is 6:1. The incidence of inguinal hernias in pregnancy 1:1000 (Malivalaya Namking *et al.*, 2008). The site of presentation being 68.1% on the right side, 23.4% on the left side and 8.4% bilateral. About 15% of childhood hernias are incarcerated, especially those in young infants. Smoking, appendectomy, abdominal operations and multiple deliveries are not associated with inguinal hernias in females. Immediate operations should be done in all patients who are ill with obstructed or locally inflamed hernia, without attempting reduction (Lt col. S. Chawla, 2001). The recurrence rate of inguinal hernia following operation has been reported to be 1-7% at the end of 2 years (Malivalaya Namking *et al.*, 2008).

Inguinal hernia most probably has been a disease ever since mankind existed (Sarabjit Singh *et al.*, 2014). The surgical history of inguinal hernias dates back to ancient Egypt (Sarabjit Singh *et al.*, 2014). Accounting for 75% of all abdominal wall hernias, and with a lifetime risk of 27% in men and 3% in women, inguinal hernia repair is one of the most commonly performed surgeries in the world. In the United States, inguinal herniorrhaphy accounts for approximately 800,000 cases yearly (Sarabjit Singh *et al.*, 2014). It is estimated that of all hernias, 66% are indirect and 33% direct (Sarabjit Singh *et al.*, 2014). Among hernias in general, it has been estimated that 25% are direct inguinal, 14% are umbilical and 5% femoral hernia. Prevalence of all types of hernia increases with age (Panchanan kundu *et al.*, 2013). Hernia is commoner on the right side as the processus vaginalis on the right closes little later than the left side (Mc Gregor 1986).

In 2012, Pathak *et al* presented a very rare case of congenital inguinal hernia with sigmoid colon as content (the six months old male child had a left sided complete hernia). Bali *et al* in 2011 presented an extremely rare case of a strangulated right inguinal hernia containing the sigmoid colon (Panchanan kundu *et al.*, 2013). Gregory (2006) presented a case of colonic inguinal hernia in a 43 year old man where the content of hernial sac was a loop of sigmoid colon with double constriction of the segment (Panchanan kundu *et al.*, 2013). Upport *et al*, in 2000, stated in a case report that a 47 year old man underwent colonic resection surgery of 23cm. long segment of perforated sigmoid colon following a road traffic accident; he had a 6 months history of left sided inguinal hernia of which the loop of perforated sigmoid colon was a content (as was revealed by a CT scan before surgery) (Panchanan kundu *et al.*, 2013).

In cases of Appendix as a content of inguinal hernia, Amyand was the first to describe the presence of a perforated appendix within the inguinal hernial sac of an eleven-year old boy and performed a successful trans-herniotomy appendectomy in 1735 (Sofia Anagnostopoulou *et al.*, 2006). The incidence of having a normal appendix within the hernial sac varies from 0.5% to 1%, whereas only 0.1% of all cases of appendicitis present in an inguinal hernia, underscoring the rarity of the condition<sup>10</sup>. Even acute appendicitis or perforation of the appendix within the sac simulates perforation of the intestine within the hernia, and does not have specific symptoms or signs (Sofia Anagnostopoulou *et al.*, 2006). A case of a three-month old boy has been reported in which a right sided sliding appendiceal inguinal hernia was diagnosed preoperatively with sonography. The occurrence of herniated appendix is mostly reported in a right inguinal hernial sac, probably as a consequence of the normal anatomical position of the appendix (Sofia Anagnostopoulou *et al.*, 2006). A literature search revealed three reported cases of left sided Amyand's hernia (Sofia Anagnostopoulou *et al.*, 2006). The occurrence of left sided Amyand's hernia may be associated with the presence of a situs inversus or malrotation. Most of the published cases have been reported as appendicitis incarcerated in a hernia. (Sofia Anagnostopoulou *et al.*, 2006).

### Case report

During routine dissection (for first MBBS students in Late Shri Lakhiram Agrawal Memorial Medical College, Raigarh

(CG), of the anterior abdominal wall in a formalin fixed male cadaver of about 60 years, a abnormal swelling on both sides of the inguinal region extending up to the scrotum was noticed. The scrotal sac was huge and extended towards the knee joint. The inferior ends of the scrotal sacs were placed up to the upper 1/3<sup>rd</sup> of the thigh. The penis measured about 3 inch long and deviated to the right. Before dissection of the cadaver and with regard to the age of the cadaver, the swelling was diagnosed (with anatomical considerations) as bilateral indirect inguinal hernia.

On meticulous dissection, the external oblique and internal oblique aponeurosis, transverses abdominis muscle with fascia transversalis were exposed and the descent of the herniated sac was clearly evident entering through the internal or deep inguinal ring (which was rather enlarged) and continuing its downward descent through the inguinal canal. It was further revealed by dissection that the tip of the herniated sac had reached the superficial inguinal ring and continued its onward journey into the scrotal sac. Longitudinal incisions were placed through the layers of the herniated coverings extending from the superficial inguinal ring down to the inferior ends of the scrotal sacs. The following findings were observed (After separating the hernia from adhesions within the inguinal canal and from its usual contents):

- The left sided herniated sac was huge and it passed through the superficial inguinal ring (surgically external inguinal ring) into the scrotal sac. The three layers of fascia surrounding the herniated sac were clearly underlined.
- After the longitudinal incision through fascia surrounding the herniated sac, a loop of intestine with its attached peritoneum (either omentum or mesentery or mesocolon) was noticed. The left spermatic cord and testis were pushed to the inferior of the herniated sac and to the right of the midline of the body. The spermatic cord was stretched thin.
- The right herniated sac was smaller as compared to the left sac. Surgical exposure revealed all the 3 layers of the spermatic fascia and the translucent peritoneum which passed beyond the external inguinal ring till the scrotal sac. The tip of the herniated sac did not reach the ends of the scrotal sac.
- The right spermatic cord was stretched and right testis assumed a lower position. The spermatic cord was thinner than the left and the testis was shrunk and smaller than the left one.
- Dissection of the covering of the herniated sac revealed only a fold of peritoneum (omentum, mesentery or mesocolon) as its content.
- No abnormality or atrophy were noticed with reference to right and left testicles.

In order to clearly identify and understand the content of the herniated sac, the anterior abdominal wall was opened with a midline incision and a well defined detailed dissection was carried out. It was noticed that greater omentum was normal and without torsion but part of it had entered the right inguinal canal. Non-obstructed loops of omentum were noted within the herniated sac of the right side. This part of the omentum

had entered through the deep ring first and then had gone through the canal, had passed out through the superficial inguinal ring and had finally reached the scrotal sac on the right side causing the mentioned swelling. Hence, indirect inguinal hernia was confirmed. On the left, the sac contained a non obstructed loop of small intestine along with mesentery. The loop entered through the deep ring and passed out through the superficial inguinal ring and reached the scrotum confirming our provisional diagnosis as indirect inguinal hernia. The pull of the loop of small intestine towards the left inguinal canal resulted in concentration of the ileum in the recto-vesical pouch and left para-rectal fossa. This part of the loop of the small intestine had a proximal part, a distal part and was completely adherent to the walls of the inguinal canal.



Figure 1. Exposure of the bilateral herniated sac on the cadaver



Figure 2. Dissected and separated spermatic cord and herniated sac on left side

After lifting up the inguinal sac, length of the inguinal canal was measured on both sides. Shape, position and measurements (length and breadth) of the deep and superficial rings were noted on both sides (Panchanan kundu *et al.*, 2013). Anatomic relation of the inferior epigastric artery was observed on two sides, especially its relation to the neck of the left hernial sac.

Related photographs were taken.

**Following measurements of the hernia sac were taken: (Panchanan kundu *et al.*, 2013)**

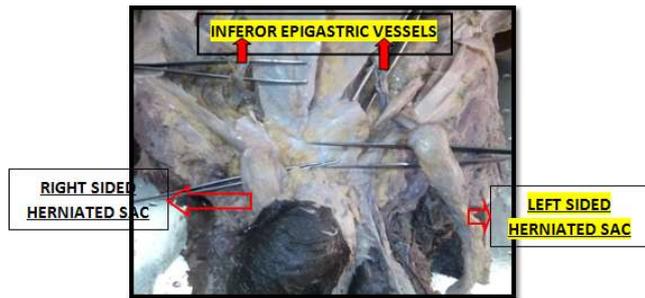
**1. Length of the sac:** Measured from neck to apex at four positions: a) Anterior, b) Posterior, c) Medial, d) Lateral aspects of the sac.

**2. Breadth of the sac:** Measured at three sites: a) At the neck b) At the apex c) Midway between the neck and apex.

**The measurements of herniated loop of gut were taken in the following way:**

1. **Length of the loop** – from base to apex.
2. **Breadth of the loop-** measured at three different sites - neck, apex and midway between them.

The loop of the herniated gut was separated from rest of the intestine, and was examined for microscopic examination.



**Figure 3. Relation of inferior epigastric vessels and herniated sac**

**RESULTS**

Both the sides has herniated sacs. But on the right side the sac contained only greater omentum without any torsion through the entire length of the inguinal canal reaching the inferior aspect of the scrotum. The final diagnosis was indirect complete inguinal hernia. The left sided sac contained a loop of ileum, as appendices epiploicae, haustrations and taeniae coli were absent, along with mesentery without any strangulation within the loop that was visible through the entire length of the inguinal canal reaching the scrotum completing our diagnosis as indirect complete inguinal hernia. The loops were separated from the adhesions and measurements taken with Vernier caliper (with 0.02mm calibrations).

**Table 1. Measurements of the inguinal canal**

Measurements		Right Side (CM)	Left Side (CM)
Length of the Inguinal Canal		4.12	4.21
Deep Inguinal Ring	Breadth	2.78	2.9
	Vertical Length	2.96	3.1
Superficial Inguinal Ring	Breadth	2.77	2.98
	Vertical Length	2.92	3.14

**Table 2. Length of herniated sac**

Different Aspects	Measurements (CM)	
	Right SAC	Left SAC
Anterior	8.56	10.44
Posterior	8.58	10.38
Medial	8.48	10.28
Lateral	8.50	10.30
Longest One	8.58	10.44

**Table 3. Breadth of the herniated sac**

Different Aspects	Measurements (CM)	
	Right SAC	Left SAC
At Neck	2.21	3.45
At Apex	2.18	3.34
Midway Between them	2.34	3.56
Widest One	2.34	3.56

**Table 4. Measurement of the herniated loop of ileum without mesentery**

		Measurements (CM)
Length (Base to Apex)		10.12
Breadth	At Neck	3.35
	At Apex	3.24
	Midway Between them	3.46

**Table 5. Measurement of the herniated loop of omentum**

		Measurements (CM)
Length (Base to Apex)		8.34
Breadth	At Neck	2.12
	At Apex	2.08
	Midway Between them	2.14

**DISCUSSION**

Terminal ileum, Caecum, ascending colon along with the coils of small intestine are the commonest contents of hernia sac<sup>7</sup>. In the present case, however, the coils of ileum with mesentery and the greater omentum were the contents of the scrotal sac. The walls part of ileum just before its entrance into the left inguinal canal were felt thick on palpation, especially near the inguinal region probably due to the rigorous friction with the inguinal ligament during hip movements. As the terminal parts of ileum along with mesentery were pulled towards the left inguinal canal, the left side of the abdominal cavity was flooded with the loops of small intestine and partial shift of Caecum, ascending colon and the part of transverse colon towards the left giving a false impression of reverse rotation of gut. The location of the superior mesenteric artery in relation to the duodenum is a prime key to diagnose the mal-rotation. The location of the artery anterior to duodenum indicates normal rotation of mid gut loop in embryonic stage of development (Neeta V Kulkarni, 2014), (Allwyn joshua *et al.*, 2014). The contents of the hernia sac were found healthy indicating the maintenance of the vascular integrity. Sergio *et al* suggest that vascular deficit, abdominal compartment syndrome and stretched mesentery may impair colonic vitality and anastomotic integrity (Allwyn Joshua *et al.*, 2014). Primary focus of the article was on the

morphological alterations and structural deformations occurring in the abdominal cavity due to malposition of part of the gut. There may be complications of inguinal hernia like 1) irreducible hernia, 2) obstructive hernia, 3) strangulated and inflamed hernia. Blood supply to a herniated viscus in compromised in strangulated hernia and it is one of the most common surgical emergencies (Russel *et al.*, 2000). In chronic hernias adhesions may impair reduction. Ascites, constipation, obstructive uropathies, chronic obstructive pulmonary diseases or chronic cough Ehler-Danlos Syndrome, Hurler and Hunter Syndromes, osteogenesis imperfecta, Marfan’s syndrome, Apert’s syndrome *et c.* and un-descended testis are associated with increased prevalence of inguinal hernias (Russel *et al.*, 2000) (Panchanan kundu *et al.*, 2013). There are many reports about asymptomatic inguinal hernia. This is probably because

of the internal compensatory alterations occurring after the herniation, (Allwyn Joshua *et al.*, 2014). Among females, indirect inguinal hernias are common. Many of these are in fact sliding types of hernias containing ovary, uterine tube or ovary uterus (Brunnicardi Charles, 2005 Lt col. S. Chawla, 2001), with or without peritoneal attachment (Lt col. S. Chawla, 2001). Because of the stress of child bearing, the transversalis fascia is stronger in the floor of the inguinal canal and hence has protective effect, so direct hernia in females is unusual (Brunnicardi Charles, 2005; Lt col. S. Chawla, 2001).

Once diagnosis of inguinal hernia in females is made, repair should be carried out promptly because incarceration occurs in the first year of life (Brunnicardi Charles, 2005 Lt col. S. Chawla, 2001). The incarcerated viscus in girls particularly in infants is usually a mobile ovary and is generally located in the labium majus (Brunnicardi Charles, 2005 Lt col. S. Chawla, 2001). Herniated ovary especially if edematous is less likely to be reduced than intestine. Reduction of an incarcerated ovary is not as urgent as reduction of an incarcerated intestinal loop (Brunnicardi Charles, 2005; Lt col. S. Chawla, 2001) Sliding hernias are rare in older women (Lt col. S. Chawla, 2001). When found in women of reproductive age; these are commonly associated with defects in genital tract development. Vaginal bleeding in a child with inguinal hernia may occur when the uterus is the sliding component of the hernia. The ligament which runs along an inguinal hernia sac in females is believed to be round ligament of uterus. It is supposed to be female gubernaculum that has altered anatomy and localization because of absence of androgen responsiveness. (Brunnicardi Charles, 2005; Lt col. S. Chawla, 2001). The sac wall may seem too thick in these cases and there may be difficult in reducing (Brunnicardi Charles, 2005; Lt col. S. Chawla, 2001). The sac should be opened in a normal appearing portion and the walls inspected for a sliding component. The mesenteric attachment of the inner sac wall is divided in the bloodless plane within the sac. The freed up tube and the ovary is then reduced easily with no compromise to the blood supply and the neck is closed in the usual way (Lt col. S. Chawla, 2001). Inguinal hernia in females may raise suspicion about the child's nuclear sex, specially in bilateral cases (Lt col. S. Chawla, 2001). About 2% of the girls with inguinal hernia have been reported to be having an intersex differentiation syndrome (Lt col. S. Chawla, 2001). Approximately 1.6% of these children presenting with inguinal hernia have apparent female genitalia with testicular feminization syndrome. In such patients, a gonadectomy on one side and isolation of the other gonad in the superficial position is done until secondary sexual characteristics develop (Lt col. S. Chawla, 2001). Bilateral exploration in all females' patients has been recommended as 90% of these girls have bilateral patency of the processus vaginalis, 40% have sliding hernias of the tubes and ovary, and none vital structures in the canal likely to be injured such as the vas deferens or testicular vessels as in males (Lt col. S. Chawla, 2001). A preoperative computed tomography of the abdomen could be helpful for diagnosis.

Successful management of the problem depends on the understanding its patho-physiology. Lateral and cephalic displacement of the internal ring beneath the transverses abdominis muscle and approximation of the crura acts as a shutter mechanism (Neeta V Kulkarni, 2014) (Sarabjit Singh *et al.*, 2014). When the arcuate fibers of the (Sinnatamby,

1999) internal oblique and transverses abdominis muscle contract, they straighten out and move closer to the inguinal ligament (shutter mechanism) at the inguinal canal (Neeta V Kulkarni, 2014) (Sarabjit Singh *et al.*, 2014). The term "obliquity of the inguinal canal" is not a perfect description since the spermatic cord is lying throughout its course on the transversalis fascia (Sarabjit Singh *et al.*, 2014). Repeated acts of crying, thereby increasing the intra-abdominal pressure do not increase the incidence of hernia in new born babies inspite of the almost absent "obliquity of the inguinal canal" or "shutter mechanism" (Sarabjit Singh *et al.*, 2014). Similarly, every individual with a high arch or a patent processus vaginalis does not develop hernia (Sarabjit Singh *et al.*, 2014).

### Conclusion

Herniation of loop of ileum with associated mesentery on one side and herniation of omentum on the other side is a rare surgical finding, as in presented paper. Though inguinal hernia is a common finding, challenge lies in the management, probably because of the variations in the content of the hernia sac and the deformities occurring in the abdominal cavity. Our report has highlighted the compensatory deformation occurring in the abdominal cavity, which may aid the surgeons in better understanding of the hernia and for surgical reduction. Female patients presenting with inguinal hernias, should undergo reduction immediately, keeping in mind incidence of incarceration of fallopian tubes and ovary in the first year of life. Young age should not contraindicate prompt repair. Hernia repair should be done under conservative technique and by skilled hands to avoid post operative complications, keeping in mind that every case has a profound anatomical and surgical importance.

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### Conflict of interests

The authors declare no conflict of interests.

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