**Short Report:**

**Variability in the Structures Passing Through Obturator Foramen**

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**Abstract:** Background: The structures passing through the obturator foramen are usually arranged as follows from above downwards – Obturator nerve, obturator artery and obturator vein. But there can be a change in this pattern which is very important for the pelvic surgeons. Aim: To study the origin of the obturator artery and to note the arrangement of the structures passing through the obturator foramen. Materials and Method: 33 formalin-fixed adult pelvises of unknown age were studied to note the origin of obturator artery and the structures passing through the obturator foramen. Results: Many specimens had variation in the structures passing through the obturator foramen. Conclusion: Knowledge of the structures in the pelvis is a must for every surgeon performing surgery in Bogros space and also for herniorrhaphy.  

**Key Words:** Obturator artery, Obturator foramen, Inferior epigastric artery

**Introduction:**
Obturator artery (OA) is usually a branch of anterior division of internal iliac artery. It supplies the medial compartment of the thigh. However, there are reports which suggest that obturator artery arises from common iliac or anterior division of internal iliac in 41.4% of cases, from inferior epigastric in 25% of cases, and in 10% from superior gluteal and in 10% from inferior gluteal/internal pudendal trunk, in 4.7% from inferior gluteal, in 3.8% from internal pudendal and in 1.1% from external iliac artery. In very rare occasions, it may come from the posterior division of the internal iliac artery. [1] The obturator artery usually passes through the obturator foramen along with obturator nerve above and obturator vein below. The normal pattern of structures passing through obturator foramen from above downwards is obturator nerve (ON), obturator artery (OA) and obturator vein (OV). However, a few studies in the past have noted the change in the arrangement of the structures passing through obturator foramen. This study was conducted in order to know the normal and variable origin of obturator artery and also to note the relation of the structures passing through obturator foramen.

**Materials and Methods:**
Thirty three formalin-fixed adult hemi-pelves of both sexes were used for the study. The internal and external iliac arteries and their branches were dissected following the instructions of Cunningham’s practical manual. The origin of the obturator artery and the structures passing through the obturator foramen were noted and photographed.

**Results:**
Results are tabulated. Table 1 shows the origin of obturator artery whereas Table 2 shows the arrangement of the structures passing through the obturator foramen. It has been seen that in majority of the pelvises, the obturator artery is given off from the anterior division of internal iliac artery (Fig 1). However, a few specimens showed the obturator artery arising from posterior division of internal iliac artery (Fig 2). OA arising from external iliac artery and inferior epigastric artery (IEA) was termed as variant obturator artery (VOA). This VOA crossed the pelvic brim to pass out through the obturator foramen and supply the medial compartment of the thigh. This artery is susceptible to injuries during the mesh stapling onto Cooper’s ligament and also during other surgeries in this region. The vein draining into the External Iliac Vein was termed as the variant obturator vein (VOV).

<table>
<thead>
<tr>
<th>Table 1: Origins of obturator artery</th>
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<tbody>
<tr>
<td>Origin</td>
</tr>
<tr>
<td>Anterior division of internal iliac artery (Fig 1)</td>
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<tr>
<td>Posterior division of internal iliac (Fig 2)</td>
</tr>
<tr>
<td>Inferior epigastric artery (Fig 3 &amp; Fig 4)</td>
</tr>
<tr>
<td>Dual origin</td>
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Fig 1: Obturator artery (OA) arising from anterior division (*) of Internal iliac artery (IIA). OV – Obturator vein, ON – Obturator nerve, VOV – Variant obturator vein. Note the structures passing through obturator foramen from above downwards are VOV, ON, OA and OV

Fig 2: Obturator artery (OA) arising from posterior division (*) of Internal iliac artery. OV – Obturator vein, ON – Obturator nerve, VOV – Variant obturator vein. Note the structures passing through obturator foramen from above downwards are VOV, ON, OA and OV

Fig 3: Variant obturator artery (VOA) arising from Inferior epigastric artery (IEA). OV – Obturator vein, ON – Obturator nerve. Note the structures passing through obturator foramen from above downwards are VOA, OV, ON

Fig 4: Variant obturator artery (VOA) arising from Inferior epigastric artery. OV – Obturator vein, ON – Obturator nerve, VOV – Variant obturator vein. Note the structures passing through the obturator foramen from above downwards are VOV, ON, OA and OV

Table 2: Structures passing through the obturator foramen

<table>
<thead>
<tr>
<th>Structures passing through obturator foramen (from above downwards)</th>
<th>Total (n=33)</th>
</tr>
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<tbody>
<tr>
<td>ON, OA, OV (normal pattern)</td>
<td>13 (39.39%)</td>
</tr>
<tr>
<td>VOA, OV, ON (Fig 3)</td>
<td>1 (3.03%)</td>
</tr>
<tr>
<td>VOV, ON, OA, OV (Fig 1)</td>
<td>16 (48.48%)</td>
</tr>
<tr>
<td>VOA, VOV, ON, OV</td>
<td>1 (3.03%)</td>
</tr>
<tr>
<td>VOV, VOA, ON, OV (Fig 4)</td>
<td>2 (6.06%)</td>
</tr>
</tbody>
</table>

Discussion:
A thorough knowledge of the vessels in the retro pubic region is necessary to perform extra-peritoneal inguinal hernioplasty and herniorrhaphy. The iliopubic ramus, is a usual anchoring site for the repair of inguinal and femoral hernia. [2] The surgeons must be aware of the unexpected origin of the obturator artery from the external iliac artery or from any of its branches as it can be inadvertently cut and result in very serious complications. In the women underwent pelvic surgery, the variant origin of obturator artery from external iliac artery turned out to be clinically important as it would serve as an alternate path for the in case of ligation or obstruction of internal iliac artery. [3] The variant obturator vein tributary to external iliac vein is dangerous in Burch procedure, as it might bleed significantly. [4] The variation in the structures of the pelvic region has gained attention of many pelvic surgeons, anatomists, endovascular specialists, orthopaedic surgeons and radiologists. The variations in the origin of obturator artery have already been mentioned by the previous authors. [1-3, 5-14] The ratio of the frequency of origin of obturator artery from the internal iliac artery to those from the epigastric and external iliac artery is 3:1. [1] In the present study a similar ratio was found. Embryologically, the anomalies affecting the arterial patterns of the limbs are based on an unusual selection of channels from a primary capillary plexus. The most appropriate channels enlarge while others retract and disappear. The obturator artery develops at a later stage. [5,11,15] The vessels in the retro pubic space forms an anastomotic network called the corona mortis. Corona mortis is formed by the accessory obturator artery, obturator artery and also the veins in this region. The variant vessels are at risk of injury during the groin and orthopedic surgeries and also in the pelvic fractures. Therefore, care has to be taken by the surgeons dealing with direct or indirect femoral hernia and obturator hernia. [12]
In the present study, 23/33 pelvises OA arose from the anterior division of internal iliac artery (69.69%), 4/33 pelvises OA arose from the posterior division of internal iliac artery (12.12%), 5/33 pelvises OA arose from the inferior epigastric artery (VOA) (15.15%) and 1/33 pelvises OA had dual origin from both the Internal iliac and External iliac arteries (VOA) (3.03%). A comparison of origin of obturator artery by various authors is shown in Table 3.

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<tbody>
<tr>
<td>Anterior division of iliac artery</td>
<td>69.69</td>
<td>21</td>
<td>44.6</td>
<td>76.62</td>
<td>44.64</td>
<td></td>
</tr>
<tr>
<td>Posterior division of iliac artery</td>
<td>12.12</td>
<td>3</td>
<td>--</td>
<td>12.5</td>
<td>23.37</td>
<td>12.5</td>
</tr>
<tr>
<td>Inferior epigastric artery</td>
<td>15.15</td>
<td>27</td>
<td>25</td>
<td>23.2</td>
<td>--</td>
<td>23.21</td>
</tr>
<tr>
<td>External iliac artery</td>
<td>0</td>
<td>Negligible</td>
<td>--</td>
<td>3.5</td>
<td>19</td>
<td>3.57</td>
</tr>
<tr>
<td>Dual origin from IIA and EIA</td>
<td>3.03</td>
<td>1</td>
<td>--</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Superior gluteal artery</td>
<td>0</td>
<td>--</td>
<td>10</td>
<td>16</td>
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</tr>
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</table>

The normal relations of the structures passing through the obturator foramen from above downwards are obturator nerve (ON), obturator artery (OA) and obturator vein (OV). But in the present study we found that the structures passing through the obturator foramen were not as per the relations mentioned in a standard text book. In most of the pelvises, the relations of the structures passing through the obturator foramen were not as per the relations mentioned in a standard text book. In most of the pelvises, the relations of the structures from above downwards are VOV, ON, OA and OV (48.48%). In 39.39% of the cases, the structures from above downwards were normal i.e., ON, OA and OV. In 3.03% cases, VOA, VOV, ON, and OV. In 3.03% it was VOA, OV, ON. Such variation in the relations was mentioned by a few authors. [14, 16]

The variant obturator vein tributary to external iliac vein is dangerous in Burch procedure, as it might lead to severe bleeding. [4]

The variant obturator artery reported here is very important surgically as it descends down in relation to the lateral pelvic wall after crossing the external iliac artery and pelvic brim. It may cause serious complications during femoral ring procedures or laparoscopic interventions as it is a very rare variation. It may compress the external iliac vein and can result in venous stagnation in the lower limb. [14]

The knowledge about such variations in the structures passing through the obturator foramen is of utmost importance to the surgeons, performing surgeries in these areas. The obturator artery passing superficial to the external iliac vein may compress it and may result in venous stagnation of the lower limb. [13] In six cases we found that the obturator artery passed superficial to the external iliac vein.

References:
