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Research article

STUDY OF PREHILAR BRANCHES OF SPLENIC ARTERY BY DISSECTION METHOD

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ABSTRACT

Background: Spleen is a large lymphoid organ which is supplied by splenic artery. It is commonly injured in blunt abdominal trauma. The treatment of splenic injury has been changed in the past 2-3 decades. Depending upon the severity of injury, either total or partial splenectomy is done. However, total splenectomy is avoided to prevent the risk of postsplenectomy sepsis or avoid the resulting decrease in immunity and hematological functions. Now a day's partial splenectomy is preferred, as it is followed by rapid regeneration of splenic tissue. During partial splenectomy, segmental branch of that affected segment is ligated. These branches show the variation as they originate from the prehilar branches of splenic artery which shows variation. **Aim:** Aim of this work was to observe the prehilar branches of splenic artery and polar arteries supplying spleen. **Methods and Material:** Sixty spleens of unknown sex were studied by dissection method. All spleens were cleaned by washing them under tap water. Then, we carefully removed the unwanted tissue around the splenic artery and its branches. **Results:** Splenic artery was divided into two primary branches at hilum in 66%, in 17% into three, and in 17% into four terminal branches. Superior and inferior polar arteries were present in 41.6 %, and 25% spleen respectively and both were present in 16.6%. **Conclusions:** Precise knowledge of prehilar and polar arteries is very important because now a days, during surgery, surgeons try to remove only affected tissue. Findings reported by us will be helpful to surgeons while performing surgical procedures on spleen.

Keywords: Spleen, Prehilar branches, Splenic artery, Partial splenectomy, Polar arteries.

INTRODUCTION

Spleen is a large lymphoid organ which is supplied by splenic artery. Near the hilum, usually it divides into two i. e. superior and inferior terminal branches. However, in some cases, middle terminal artery may be present.

The terminal branches further undergo several subdivisions which are the segmental intrasplenic branches. The branches of the splenic artery entering into spleen through the poles of the spleen are called polar arteries i.e. superior and

inferior polar arteries¹. The human spleen is divided into two or three main arterial segments and these segments are separated by a definite avascular plane². Each main segment is subdivided, usually into two to four secondary segments which are not constant. The architecture of these segments and the avascular planes between them are very variable³. Also, the polar segments are separated from the remaining of the organ by constant avascular plane^{1,4}.

Spleen is commonly injured in blunt abdominal trauma or during automobile or bicycling accident, in which internal hemorrhage occurs. Depending upon the severity of injury, either total or partial splenectomy is done. However, total splenectomy is avoided to prevent the risk of postsplenectomy sepsis or avoid the resulting decrease in immunity and hematological functions. Now a days partial splenectomy is preferred, as it is followed by rapid regeneration of splenic tissue. During partial splenectomy, segmental branch of that affected segment is ligated. These branches show the variation as they originate from the prehilum branches of splenic artery which shows variation^{2,5,6}.

Kehila and Abderrahim did the partial splenectomy in cases of major trauma, after the splenic vessel ligation⁷. While performing splenic surgery, precise knowledge of the terminal and polar arteries is essential because avascular plane of the spleen and its segmental pattern which mainly depends on the number of terminal and polar arteries⁶. The aim of this study was to accurately identify the prehilum branches of the splenic artery and polar arteries supplying spleen. The aim of this work was to observe the prehilum branches of splenic artery and polar arteries supplying spleen.

MATERIAL AND METHODS

The present work was carried out in the Anatomy

Department of KIMS, Narketpally, Nalgonda, Andhra Pradesh, India. This study was approved by the Institutional Ethical Committee of KIMS. For this study, sixty spleens of either sex were studied by dissection method. Spleens which showed perisplenic adhesions or marked pathological changes were rejected.

Spleens were removed from abdomen by detaching their various attachments and by cutting the splenic vessels of minimum 5-6 cm in length. All spleens were cleaned by washing them under tap water. Then, we carefully removed the unwanted tissue around the splenic artery and its branches. We dissected all spleens carefully along the course of the branches of the splenic artery. Then, we noted the number of terminal and the polar branches of the splenic artery and their variations were noted.

RESULT

Splenic artery was originated from the celiac trunk in all spleens. Splenic artery was divided into two primary i.e. superior and inferior branches, at the hilum in 66% (40 out of 60). In 17% (10 out of 60) spleen it was divided into three, superior, middle and inferior branches (Fig. 1) and in 17% (10 out of 60) spleen it was divided into four terminal branches (Fig.2). All polar arteries were originated from splenic trunk. In 50 spleens polar arteries were present (83.3%). Superior polar arteries were present in 41.6 % (25), inferior polar in 25% (15) and both (Fig. 3) were present in 16.6% (10). According to this branching pattern the spleen had two lobes, when there were superior and inferior branches and three lobes, when there were superior, middle and inferior terminal branches. Additional lobes were present, when there were polar arteries. Thus the splenic lobes could vary from 2-4 in numbers.

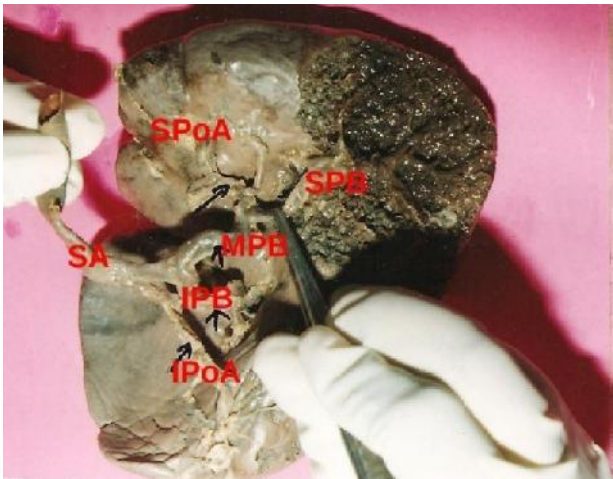


Fig.1: Showing Three branches of Splenic artery and two polar arteries (i.e. superior and inferior)*

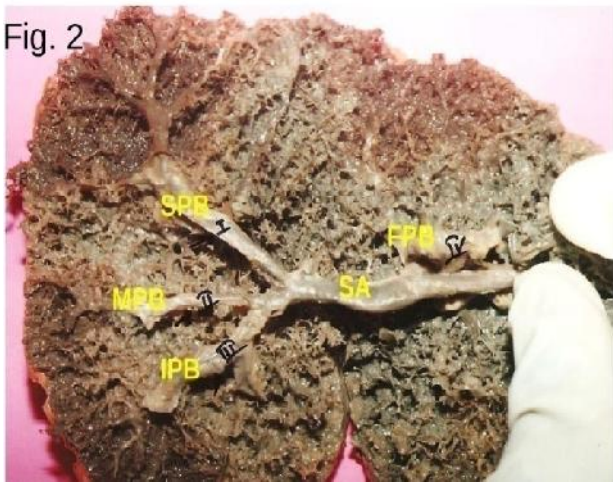


Fig.2: Showing Four branches of splenic artery*

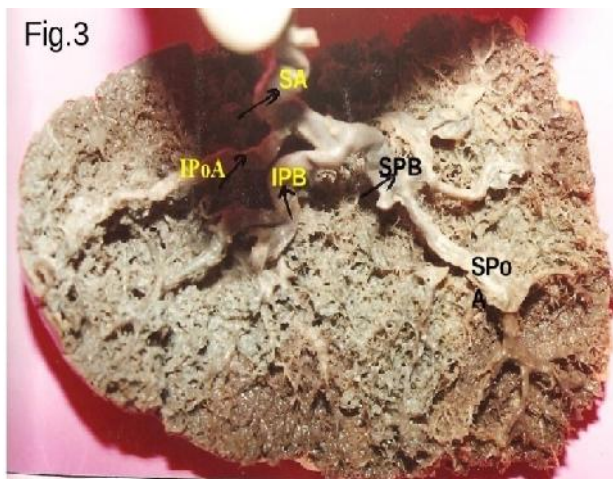


Figure.3: Showing Superior and Inferior polar arteries*

*SA-Splenic Artery, SPB-Superior Primary Branch, IPB-Inferior Primary Branch, MPB-Middle Primary Branch IPoA-Inferior Polar Artery, SPoA-Superior Polar Artery

DISCUSSION

Spleen is highly vascular and friable organ and therefore it cannot be sutured⁶. However, it has two or three main arterial segments and these segments are separated by a definite avascular plane^{2, 4, 8, 9}. Each main segment is subdivided, usually into four less secondary segments which are not constant. The architecture of these segments and the avascular planes between them are very variable. Also, the polar segments are separated from the remaining of the organ by constant avascular plane. During the partial splenectomy, a particular segmental branch of the injured tissue is ligated. So, precise knowledge of the prehilum and further branches of the splenic artery is essential while performing splenectomy^{1, 4}.

In the present study, the primary and the polar branches of the splenic artery (Fig. 1, 2, 3) were observed. Two primary branches were found in 66%, three in 17% and four in 17% four. When we compared our results (Table 1) with earlier studies done by various workers, we obtained different percentage pattern. We observed four primary branches of the splenic artery (Fig. 2) in 17% but no other researcher observed four branches (Table 1).

We observed superior and inferior polar branches of the spleen which were arising from the splenic artery. Incidence of superior polar artery was in accordance with Chaware et al¹⁰, but we observed lower percentage of inferior polar artery. Superior and inferior polar arteries were present in 16.6 % spleen which was on the higher side when compared with other researches percentage obtained by them (Table 1). Prehilum branching of splenic artery and polar arteries of spleen shows variations which may be because of differences in sample size and population from where spleens were obtained. This knowledge of vascular pattern helps in identification of lobes or segmentation in spleen, which is important in partial splenectomy and surgical repair of spleen injuries¹¹.

Table 1- Showing the comparison of percentage of division of splenic artery studied by different authors.

| Author | Percentage of Division of Splenic Artery | | | | | |
|---|--|-----------|-----------|----------------|-----------|-------------|
| | Two | Three | Four | Polar Arteries | | |
| | | | | Superior | Inferior | Both |
| Gupta et.al (1976) ² | 84 | 16 | - | - | - | - |
| Michail (1979) ⁸ | 77 | 23 | - | 12 | 50 | 12 |
| Katritis et al. (1982) ⁴ | 85.7 | 14.3 | - | - | - | - |
| Chakravarthi. et al (2003) ³ | - | - | - | 56 | 27 | - |
| Chaware et al. (2012) ¹⁰ | 85 | 14.42 | - | 40.53 | 54.06 | - |
| Londe et al. (2013) ¹¹ | 90 | 10 | - | 33 | 54 | 12.6 |
| Present study | 66 | 17 | 17 | 41.6 | 25 | 16.6 |

CONCLUSION

In the present study, we observed that splenic artery divides into two to four branches at hilum. Also it gives polar branches to it. These branches divide the spleen into definite arterial segments which are separated by an avascular plane. It is interesting to note down that, we observed four primary branches of splenic artery in 17% but no other researcher observed four branches. Precise knowledge of prehilars and polar arteries is very important because nowadays, during surgery, surgeons are trying to remove only affected tissue. Finding reported by us will be helpful to the surgeons while performing surgical procedures on spleen.

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