*Section A -Research paper*
*ISSN 2063-5346*

# A Study on Prevalence and Histological Aspects of Human Adult Cadaveric Accessory Spleen

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***Received Date: 12/05/2023 Revised Date: 02/06/2023 Accepted Date: 04/07/2023***

**Abstract**
**Background:** The spleen is a hemolymph organ in the human body. It is the largest and most clinically important lymphoid organ. The spleen can have a wide range of anomalies in its shape, location, number, and size. The accessory spleen is a common congenital anomaly that is due to congenital failure of the fusion of splenicules. The accessory spleen is mostly asymptomatic but can mimic certain tumors and also can lead to relapse post-splenectomy. **Aim of the Study:** The present study was undertaken to study the incidence, and microscopic structure of the accessory spleen in human adult cadavers and to compare the results with previous studies. **Materials and Methods:** The present study was done on 41 human adult cadaveric spleens obtained from the Department of Anatomy, J.N. Medical College, Belagavi. Accessory splenic tissues, if present, were noted, photographed, and studied histologically. **Results:** Accessory spleens were found in 7.32% of cases in the form of roundish nodules. They were observed at the hilum of the spleen. On microscopy of the accessory spleen, the white pulp was comparatively ill-defined, and the red pulp was predominant. **Conclusion:** These findings will be helpful for Surgeons, Radiologists, Oncologists, and to Anatomists too.
**Keywords:** Spleen, Accessory spleen, Histology of accessory spleen, Accessory splenic nodules.

**Introduction:** The Spleen is an important hemolymph organ in humans, located in the upper left hypochondriac region and partly in the epigastrium. [1,2] Spleen has an important role in the storage of blood, formation of lymphocytes, and defense against foreign particles [3]. Because of their hematological and immunological role, Surgeons also like to conserve splenic tissue during splenectomy. [4] The most common anomaly of the spleen is the accessory spleen, with an incidence rate of 10% to 30 % in autopsy series. [1-3,5] Mostly it is

asymptomatic but can mimic certain tumors and also can lead to relapse post-splenectomy. The present study was undertaken to study the incidence, histological aspect of the accessory spleen in human adult cadavers,

**Materials and methods**

This study was done on 41 formalin-fixed human adult cadaveric spleens of both sexes obtained during routine dissection practicals of undergraduate medical students in the Anatomy department of J.N. Medical College, KAHER, Belagavi and USM-KLE University, Belagavi. These spleens were observed for any anomalies. Accessory splenic tissues, if present, were noted, photographed, and subjected to histological study, and later photomicrographs of them were taken.

**Results**

During the study, we found 3 accessory splenic nodules (7.32%) at the hilum of the spleen. They were small, round, approximately 0.5 x 0.5 mm.

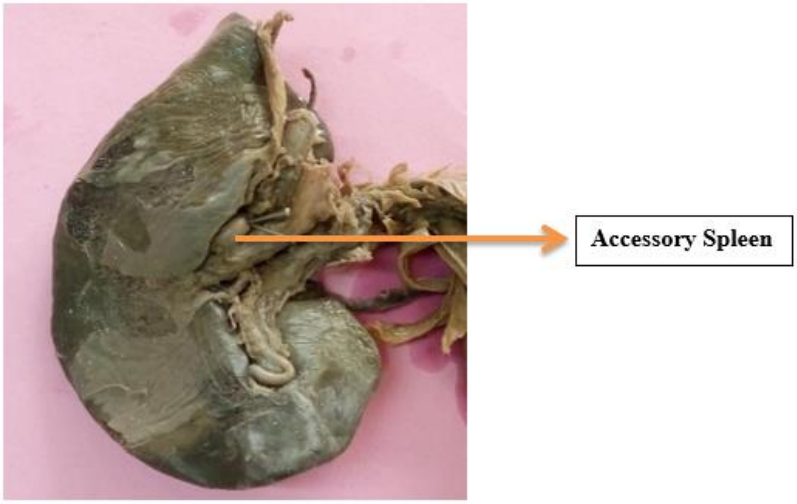


**Fig. 1 -Showing presence of Accessory spleen at the hilum**

**Table 1: Number and Percentage of Accessory Spleens**

| Total No. of Spleen specimens | No. of Accessory Spleens | Percentage % of Accessory Spleens |
|---|---|---|
| 41 | 03 | 7.32 |

On histological examination, the microscopic structure of the accessory spleen was fairly similar to that of the main spleen. Accessory Spleens showed the prominent connective tissue capsule and the septae as seen in the main spleen. The Malpighian bodies of the white pulp were comparatively ill-defined. The red pulp population was significantly predominating with the abundant number of lymphocytes arranged in the form of splenic cords of Billroth. Numerous sinusoids and trabecular arteries were seen.

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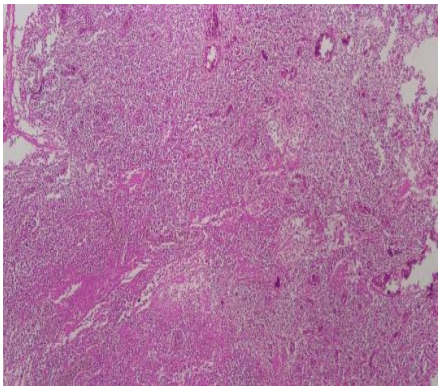
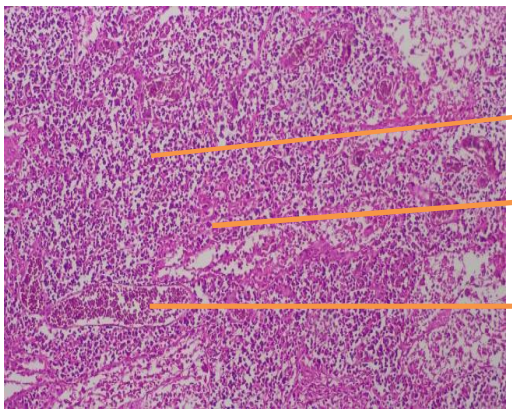
**Table 2: Histological (H & E staining) photomicrographs of Accessory spleens**

<table>
<tr><td rowspan="2">Accessory spleen Specimen</td><td colspan="2">Findings on H & E staining-<ul><li>White pulp - Ill-defined Malpighian bodies</li><li>Red pulp -Numerous sinusoids with an abundant number of lymphocytes arranged in the form of splenic cords of Billroth.</li></ul></td></tr>
<tr><td>Findings on H & E Staining (4 X Magnification)</td><td>Findings on H & E Staining (10 X Magnification)</td></tr>
<tr><td>Specimen Number 1</td><td>  </td><td> 
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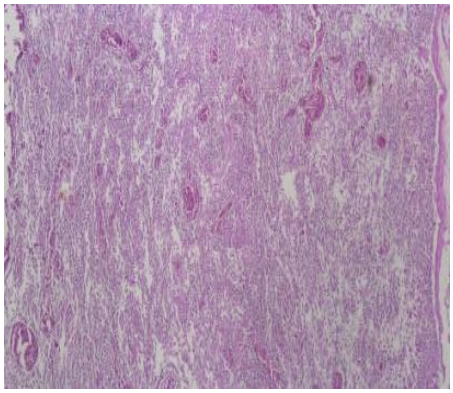
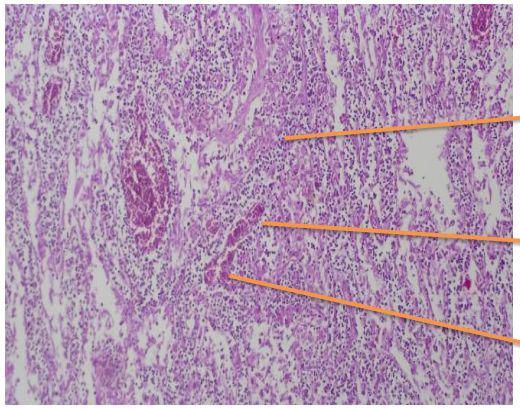
<tr><td>Specimen Number 2</td><td>  </td><td> 
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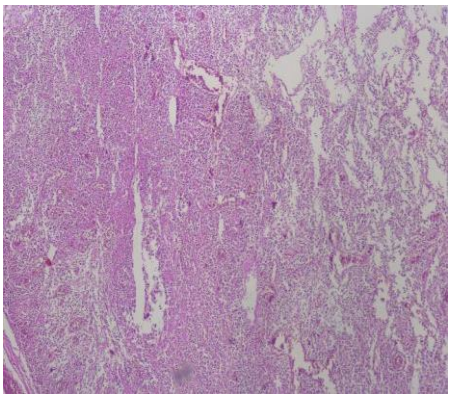
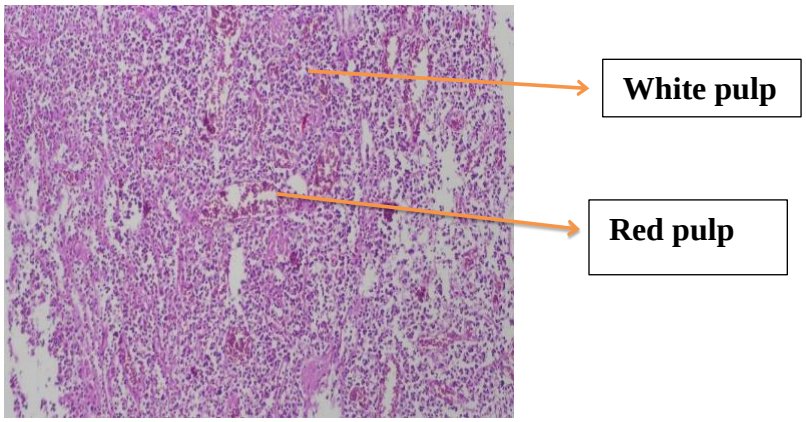
|---|---|---|
| **Specimen Number 3** |  |   |

**Table 3: Comparison of incidence of Accessory spleen with previous studies**

| specimens | Study | Total no. of adult spleen specimens studied | No. of accessory present found | Percentage (%) |
|---|---|---|---|---|
| 1 | **The present study (2019)** | 41 | 3 | 7.32 |
| 2 | Aneja PS et al25 (2016) | 30 | 2 | 6.6 |
| 3 | Shabnam Mohammad et al27 (2016) | 693 | 5 | 0.7 |
| 4 | N.Dogaet al. al28 (2011) | 720 | 48 | 6.7 |
| 5 | Chaware et al. 13 (2012) | 111 | 5 | 4.5 |
| 6 | Rayhan KA et al26 (2011) | 61 | 14 | 22.95 |

**Table 4: Comparison of the histological structure of the Accessory spleen with the Previous studies**

| Sr No. | Study | Capsule | Trabeculae | White Pulp | Malphigian Bodies with Eccentric Arteriole | Red Pulp with Splenic Cord of Billroth And Sinusoids | Trabecular Arteries |
|---|---|---|---|---|---|---|---|
| 1 | **The Present study (2019)** | + | + | + | ill-defined | + | + |
| 2 | Shabnam Mohammad et al[27] (2016) | + | + | + | + | + | + |
| 3 | Aneja PS et al[25] (2016) | + | + | + | + | + | + |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | Jyotsna et al. [29](2015) | + | + | + | ill-defined | + | + |
| 5 | Harsh Mohan et al. [24] (2002) | + | + | + | + | + | + |

**Discussion**

The spleen starts developing in the 5th week of intrauterine life from a mass of mesenchymal cells originating in the dorsal mesogastrium as a localized thickening of coelomic epithelium.[4] The spleen is nodular in the fetus, but the lobules normally disappear before birth. Some congenital anomalies of the spleen are absence of the spleen, splenic lobulations, wandering spleen, and polysplenia, accessory spleens. ,[4,5] Out of these the accessory spleen is the most common anomaly. During spleen development, small masses of the splenic tissue may become detached from the main mass and develop into accessory spleens. [6,7] Or it may develop due to the imperfect fusion of the splenic masses during embryonic life.[8] Morphologically and functionally, accessory spleens are similar to the normal spleen and receive their vascular supply from the branches of the splenic artery [9,10]. It can be mistaken for some tumor-like conditions, and thus important it is of great importance in hematological disorders. [11,12]

The accessory spleen has an incidence of 4.5 to 24.28% in the Asian population. [13,14,15]. Characteristically, they are smooth with a round or oval shape and are about 1.0-1.5cm in diameter. [14,16]. Their size is not larger than 2cm in diameter. [17] Most often there is one accessory spleen,(85%) sometimes two (14%), and rarely three or more (1%). [17,18] The most common location is the hilum of the spleen in a gastrosplenic ligament (50%), but it may be found behind the tail of the pancreas (30%), or rarely within the greater omentum of the stomach, mesentery of the small intestine, mesocolon, pancreas, [19] kidney, [20] pelvis as an adnexal mass, [21] but rarely in the gonads.[22] In the present study, only the hilar region was taken into consideration, which may be the reason why we found only a small number of accessory spleens (Table 2). Most of the Accessory Spleen are asymptomatic and are discovered incidentally by abdominal ultrasound, CT scan, or laparotomy during the investigation of another problem. In a few cases, they become symptomatic causing abdominal pain due to torsion and, infarction, cyst formation.[21] Accessory spleen needs to be distinguished from splenosis, which is an acquired condition associated with splenic trauma or surgery having an incidence of 67% in these patients. [23]

In the present study, the microscopic structure of the accessory spleen was mostly similar to the main spleen, except for the Malphigian bodies of the white pulp, which were comparatively ill-defined. The red pulp was significantly prominent. Functionally this accessory spleen might not be as effective in its immune responsibility as the main spleen corresponds to the defined white pulp. These findings correspond with the previous histological studies of the accessory spleen. [24,25,26,29] (Table No. 3)

The identification of an accessory spleen is important because it may be mistaken as a pathology like lymphadenopathy or a tumor in the pancreas, adrenal gland, or kidney. Sometimes, it can cause symptoms due to torsion, hemorrhage, spontaneous rupture, or cyst formation. [11] Thus it is important to identify Accessory spleens either by CT scan or by 99m Tc heat-denatured red blood cell scan and confirmed by histopathologic examination to avoid misdiagnosis.[24]

Awareness of the prevalence of the accessory spleen and identifying accessory spleens at the time of splenectomy is of importance for surgeons because if they are left behind, they will undergo hyperplasia and hematological disease in cases of hematological disorders. [5,11] Accessory spleens resemble normal spleen in structure and immunologic functions. So in splenectomy for non-haematologic causes, accessory spleens should be preserved to prevent infection and sepsis after splenectomy.[11]

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| 3 | Aneja PS et al[25] (2016) | + | + | + | + | + | + |
| 4 | Jyotsna et al. [29](2015) | + | + | + | ill-defined | + | + |
| 5 | Harsh Mohan et al. [24] (2002) | + | + | + | + | + | + |

**Conclusion**

Awareness of the possible presence of the accessory spleen is important –

-To the **Surgeons**, while they perform surgical operations which are related to the spleen to avoid and prevent any complications and to obtain a good operative result.

-To the **Radiologists** during diagnostic procedures to prevent interpretation errors in diagnostic imaging.

-To the **Oncologists**, to rule out differential diagnosis.

-And also important for **Anatomists** during routine cadaveric dissections.

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