

# Retrospective radiologic analysis of accessory spleen by computed tomography

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## Abstract

**Objectives:** The aim of this study was to define the incidence and classify locations of accessory spleen using CT in a large Turkish population and to compare our findings with earlier studies performed in other populations.

**Methods:** A total of 930 patients were included in the study and evaluated retrospectively using CT. The CT images were obtained using Philips Ingenuity 128 slice computerized tomography device.

**Results:** 930 patients (413 females, 44.4%; 517 males, 55.6%) who underwent CT imaging for various indications were included in this study. Out of these, 55 had an accessory spleen (5.9%), and four had polysplenia. Most common location of accessory spleen was hilum (49.9%) followed by the gastrosplenic ligament (21.81%), infrasplenic area (18.18%), pancreatic tail (3.64%), splenorenal ligament (3.64%) and suprasplenic area (3.64%).

**Conclusion:** Accessory spleen is a common variation encountered in the abdominal cavity. Most and least common locations of this variation should be well known to prevent radiologic misdiagnosis and surgical complications.

**Keywords:** accessory spleen; radiologic anatomy; splenosis

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## Introduction

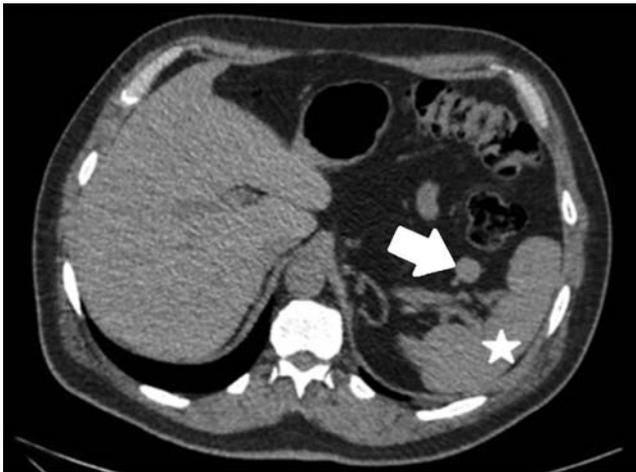
Ectopic splenic tissue can be found in the body in two different types; accessory spleen and splenosis. Accessory spleen is a congenital anomaly which presents with nodule of splenic tissue apart from main body of spleen.<sup>[1,2]</sup> It results from the failure of fusion of splenic buds in dorsal mesogastrium in the fifth week of fetal life.<sup>[1,2]</sup> Splenosis is an acquired condition due to autotransplantation of splenic tissue during surgical intervention or traumatic rupture of spleen, caused by the spread of splenic tissue after a splenic injury.<sup>[3]</sup>

It is possible to differentiate accessory spleen from splenosis by means of histology. Accessory spleens have capsule, hilum and trabeculae. The smooth muscle and elastic elements seen in a real splenic capsule are not visible in splenosis nodules. Splenosis nodules are also lack of hilum with vessels.<sup>[3]</sup> They are supplied by newly formed arteries which penetrate the capsule.<sup>[4]</sup> Also different from

accessory spleens, Malpighian follicles and central arterioles are not visible in splenosis nodules.<sup>[2,3]</sup>

Accessory spleens are most commonly found near the splenic hilum, in the gastrosplenic ligament, splenorenal ligament, splenocolic ligament, pancreatico-splenic ligament, greater omentum, gastrohepatic omentum, mesentery, around the tail of pancreas, anywhere along the splenic vessels, and rarely in gonads.<sup>[2,5,6]</sup>

Accessory spleen is usually an incidental finding with no clinical significance. Although asymptomatic, it can be of clinical importance for differential diagnosis of tumors. Knowledge of accessory spleen is essential for radiologists to prevent misdiagnosis. Accessory spleens may present with complications such as torsion, hemorrhage, spontaneous rupture, hematoma, bowel obstruction or cyst formation which acquires surgical approach. Surgeons must keep this variation in mind during operations. Besides, they have to know the most common



**Figure 1.** CT scan of accessory spleen at splenic hilus. Accessory spleen (arrow); spleen (star).



**Figure 2.** CT scan of accessory spleen at the gastrosplenic ligament. Accessory spleen (arrow); spleen (star); stomach (diamond).

locations for this anatomical variation for proper treatment.<sup>[2]</sup>

In this study, we aimed to define and classify locations of accessory spleen in a large population by CT and compare our results with earlier studies performed in other populations.

### Materials and Methods

A total of 930 patients (413 females, 44,4%; 517 males, 55.6%) were included in the study and retrospectively evaluated by CT. Patients with any surgical or other trauma history for differential diagnosis of splenosis nodules from accessory spleen in radiologic images were excluded from the study.

The CT images of the cases were obtained from the archive system of TOBB ETU University. CT examinations were obtained with Philips Ingenuity 128 slice computerized tomography device (Philips Medical Systems, Cleveland, OH, USA). Patient dose parameters were adjusted automatically by the device. 0.8 mm slice thickness and a pitch value of 1 were used. All abdomen CT scans include an area from sub diaphragmatic level to femoral heads to view entire abdominal area with or without an oral and/or intravenous contrast media. 300/100 ml or 350/100 ml non-ionic iodinated contrast materials were used.

Ethical permission was received by TOBB ETU Faculty of Medicine Clinical Research Ethics Committee (number: KA EK 118/051).

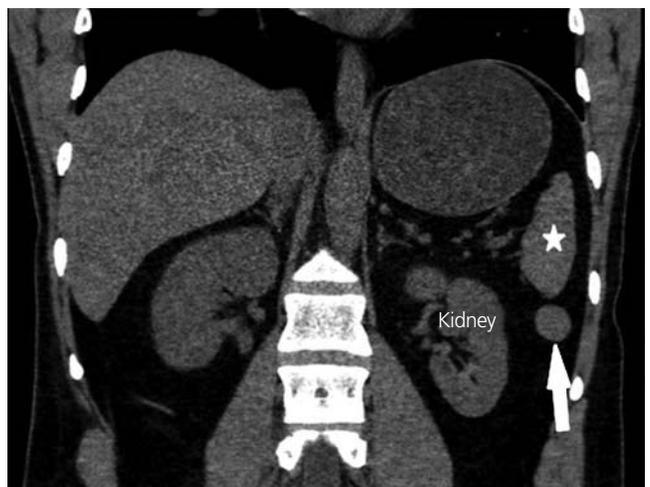
Descriptive statistics were used to get the frequency of each variation category of location.

### Results

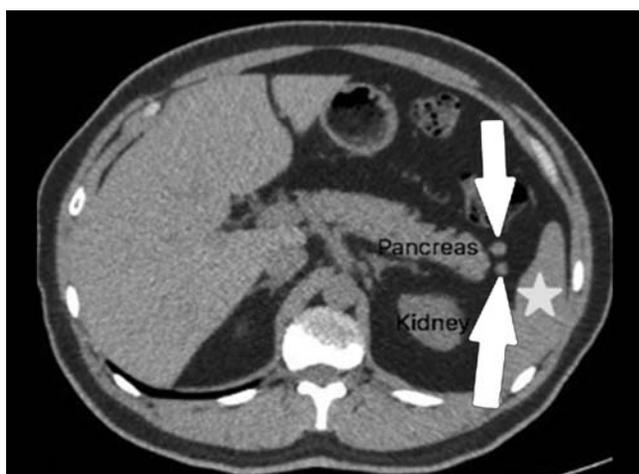
Out of 930 patients, 55 had accessory spleen (5.9%). The mean age of the patients possessing an accessory spleen was 40 (range: 19–90) years. Out of the 55 patients with accessory spleen 34 (61.82%) were males and 21 (38.18%) were females. Four of the 55 patients had polysplenia (7.27%).

The mean diameter of the accessory spleens was 14 (range: 3–20) mm.

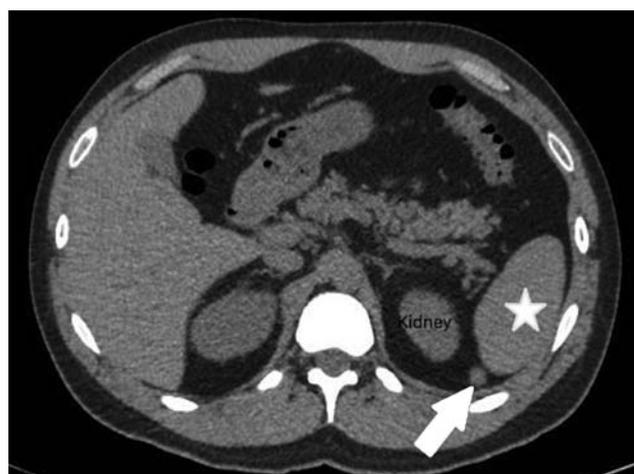
Twenty-seven (49.9%) of the accessory spleens were located in hilum (**Figure 1**), 12 (21.81%) in gastrosplenic ligament (**Figure 2**), 10 (18.18%) in infrasplenic area (**Figure 3**), 2(3.64%) in pancreatic tail (**Figure 4**), 2



**Figure 3.** Coronal CT scan of accessory spleen below spleen level. Accessory spleen (arrow); spleen (star).



**Figure 4.** Transverse CT scan of accessory spleen at pancreatic tail. Accessory spleen (arrow); spleen (star).



**Figure 5.** CT scan of accessory spleen at splenorenal ligament. Accessory spleen (arrow); spleen (star).

(3.64%) in splenorenal ligament (**Figure 5**) and 2 (3.64%) in suprasplenic area (**Table 1**).

## Discussion

Mesenchymal condensation develops within the dorsal mesogastrium of the lesser sac at the end of the fourth week of fetal life. This condensation differentiates to form spleen during the fifth week.<sup>[7]</sup> Spleen functions as a hematopoietic center until late fetal life and retains this function even in adult life.<sup>[8]</sup> Smaller splenic condensations called accessory spleens may develop in proximity of primary spleen.<sup>[7,9]</sup> Their size varies from 0.5 to 3.75 cm in diameter. The most common locations are the hilum and the anterior aspect of spleen. Spleen initially forms nears the urogenital ridge and gonads may become fused to splenic tissue. On rare occasions splenogonadal fusion leads splenic tissue to be pulled down into pelvic cavity.<sup>[10]</sup>

**Table 1**  
Locations of accessory spleen.

Location of accessory spleen	n	%
Hilum of spleen	27	49.09
Gastrosplenic ligament	12	21.81
Splenorenal ligament	2	3.64
Tail of pancreas	2	3.64
Suprasplenic area	2	3.64
Infrasplenic area	10	18.18
Total	55	100

Accessory spleen is usually an incidental finding with no clinical significance. Although it is asymptomatic it can be of clinical importance for differential diagnosis of tumors. Accessory spleen in an unusual location can resemble a metastatic lymph node or tumor in pancreas, adrenal gland, kidney, stomach, intestine or even in testis.<sup>[2,11]</sup> Knowledge of accessory spleen is essential for radiologists to prevent misdiagnosis.

Splenectomy is a curative treatment option in hematologic diseases such as hereditary spherocytosis and chronic immune thrombocytopenic purpura.<sup>[12]</sup> Surgeons must keep accessory spleen in mind at the time of splenectomy because therapeutic effect depends on the complete removal of splenic tissue. Besides they have to know most common locations of this anatomical variation for proper treatment. Because once they are left behind during the first surgery they will undergo hyperplasia and cause recurrence of these diseases.<sup>[2,12,13]</sup> Preoperative radiologic examinations before splenectomy would help to indicate the accessory spleens during surgery.

Accessory spleen is usually asymptomatic, but it may present with complications such as torsion, hemorrhage, spontaneous rupture, hematoma, bowel obstruction or cyst formation which acquires surgical approach.<sup>[2,11,14,15]</sup> Beside the common locations it must be kept in mind that accessory spleens may be multiple but rarely more than six.<sup>[16]</sup> On the other hand, splenosis presents as numerous nodules (as many as 400) in the abdominal cavity.<sup>[2,4]</sup> Multiple accessory spleens must be evaluated during the surgery to prevent recurrence of the aforementioned complications.

Accessory spleen is not looked for during abdominal operations except splenectomy.<sup>[1]</sup> Hence, it is difficult to indicate the real incidence. On the other hand, radiologic diagnosis of this variation is difficult because of the fatty tissue entirely surrounding the accessory spleen or its appearance similar to lymph node.<sup>[1]</sup> Detailed preoperative radiologic evaluation will achieve detection rates and prevent recurrence and complications in patients who have splenectomy indication. Radiologic studies with expanded patient series will also be valuable to indicate the real incidence.

It has been reported in the textbook of Snell's Anatomy that 10% of the normal population has accessory spleen.<sup>[17]</sup> Mortelet et al.<sup>[18]</sup> reviewed 1000 CT scans retrospectively and found accessory spleen in 15.6% of patients from USA; Romer et al.<sup>[19]</sup> reviewed 1,735 CTs and found the incidence as 11% incidence in Switzerland. Chaware et al.<sup>[20]</sup> reported the incidence in India as 4.5%. Yıldız et al.<sup>[21]</sup> reported accessory spleen incidence in a Turkish population as 10–30%. In this study, the accessory spleen was present in 5.9% of our cases and this can be considered as lower than these earlier reports.

The youngest case reported in the literature was 17 and the oldest 67 years old.<sup>[22]</sup> The youngest case observed in the present study was 19 years old, while the oldest was 90. The most common locations in the literature were splenic hilum (75%) and tail of pancreas (20%).<sup>[22]</sup> In the present study, 49.09% of the accessory spleens were in hilum. The most common location indicated in the present study is consistent with the previously published data.

Romer et al.<sup>[23]</sup> and Szold et al.<sup>[24]</sup> reported the mean diameter of accessory spleen in a range from 10 mm to 35 mm. Unver Dogan et al.<sup>[25]</sup> and Kang et al.<sup>[26]</sup> measured the mean diameter as 16 mm and 15 mm respectively. In the present study, we measured the mean diameter of the accessory spleen 14 mm which is in consistent with the aforementioned studies.

Bora et al.<sup>[27]</sup> reported accessory spleen was more frequent in males (52.27%) than in females (47.73%). Vikse et al.<sup>[28]</sup> also analyzed gender distribution of this variation and declared it more common among females (15.4%).

This study has some limitations such as missing of past medical history. Future prospective studies with larger sample size may provide more exact information of incidence and will enable the researchers to question the clinical symptoms.

## Conclusion

Studies on radiological scans, surgery series and autopsy series will be useful for determining the incidences in different populations. This study presents important knowledge to surgeons, radiologists, anatomists and oncologists about the incidence and locations of accessory spleen in Turkey.

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