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CASE REPORT

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Situs inversus partialis (levocardia): an incidental discovery of an extremely rare case during the autopsy of a female with suicidal poisoning

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Abstract

Background Situs inversus is a rare congenital anomaly. In this condition, the abdominal and chest organs are positioned in reverse, a mirror image of the normal anatomical position. It is divided into two categories. 1. Situs inversus totalis, in which the apex of the heart points toward the right side. 2. Situs inversus partialis or incompletus, in which the apex of the heart points toward the left side. Situs inversus totalis is present in 1 per 10,000 to 50,000 individuals of the general population, whereas situs inversus partialis is a much rarer condition and is present in 1 per 2,000,000 individuals of the general population. The term situs ambiguous is also used for the arrangement of organs and vessels in an unordered manner.

Case presentation In this paper, we present an extraordinary case of situs inversus partialis discovered incidentally during the autopsy of a female body with a documented history of suicidal poisoning. This unique finding sheds light on the diagnostic challenges and implications of situs inversus partialis, especially in patients with underlying medical conditions.

Conclusions This report underscores the importance of thorough and systematic investigations during autopsy examinations to identify and comprehend rare anatomical anomalies that may otherwise remain unnoticed. Increased awareness of such rare congenital anomalies may contribute to a better understanding of their prevalence and potential clinical implications for healthcare professionals and researchers.

Keywords Levocardia, Congenital anomaly, Forensic autopsy, Diagnostic modalities, Situs inversus with dextrocardia, Abdominal diseases, Rare congenital condition, Situs inversus with levocardia, Situs inversus incompletus

Introduction

Situs inversus is a rare congenital anomaly. In this condition, the abdominal and thoracic organs are positioned in reverse, which is a mirror image of the normal anatomical position (Shogan and Folio 2011). Situs solitus refers to the normal anatomical position of the thoracic and abdominal viscera. Situs inversus is a mirror image of situs solitus (Shogan and Folio 2011; Maldjian and Saric 2007; Fulcher and Turner 2002). Situs inversus is divided into two categories: First is Situs inversus totalis, in which the apex of the heart points toward the right side (Maldjian and Saric 2007; Fulcher and Turner 2002). Seond is Situs inversus partialis or incompletus, in which the apex of the heart points toward the left side (Maldjian and Saric 2007; Fulcher and Turner 2002). Situs inversus

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totalis is present in one per 10,000 to 50,000 of the general population (Eitler et al. 2022), whereas situs inversus partialis is a much rarer condition and is present in one per 2,000,000 of the general population (Situs inversus 2023). Situs inversus is present 1.5 times more predominantly in males than in females (Eitler et al. 2022). Situs inversus totalis is also called situs inversus with dextrocardia, whereas situs inversus partialis is called situs inversus with levocardia. The term situs ambiguous is also used for the arrangement of organs and vessels in an unordered manner, except, as mentioned above (Maldjian and Saric 2007; Tonkin and Tonkin 1982).

During conducting an autopsy examination of a case of suicidal poisoning, an incidental finding of situs inversus with levocardia was observed. This is a very rare case for several reasons. First, it was situs inversus incompletus, a subtype of situs inversus, a rare condition (Situs inversus 2023). Second, it was found in the female body, which is normally less prevalent than that in males (Eitler et al. 2022). Third, the deceased was asymptomatic, while congenital heart disease is the most common in this subtype (Moscovitz et al. 1952; Harris and Rainey 1965; Van Praagh et al. 1964; Rosenbaum 1962). Documenting and studying such exceptional cases can provide valuable insights into the situs inversus partialis, contributing to the advancement of medical knowledge and education.

Case presentation

A 17-year-old female body was brought by police for a medicolegal autopsy with an alleged history of ingestion of an unknown poisonous substance at home for unknown reasons. The deceased had not suffered from any major illness in the past. After ingestion of an unknown poison, she was first transferred to a private hospital for treatment, but she was unable to survive before treatment was started. No external injury was detected during the autopsy examination. The body was on average built and moderately nourished. No remarkable external findings were noted. On internal examination, mirror positioning of the abdominal organs was observed.

As shown in Figs. 1 and 2, the liver was located on the left side of the abdomen. The stomach was on the right side and lifted to show an underlying right sided spleen. The small and large intestines also followed the mirror position. However, the organs were in the normal anatomical positions in the thoracic cavity. The apex of the heart was pointed toward the left side. This unique anatomical arrangement confirms the diagnosis of situs inversus with levocardia, which is also referred to as situs inversus incompletus or partialis. Situs inversus incompletus is frequently associated with congenital heart anomalies or diseases; however, no prior illness

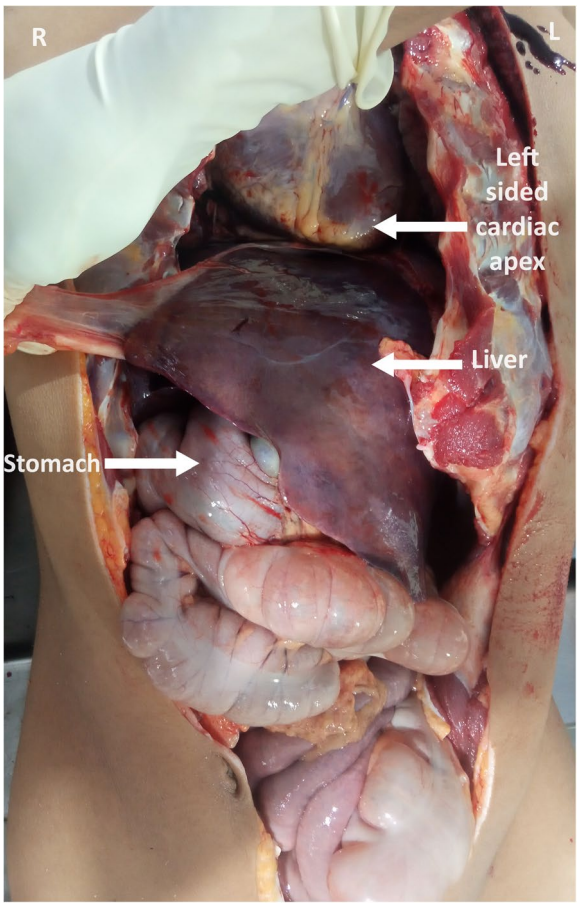

Fig. 1 Left sided liver with cardiac apex directed towards left side

was found in the deceased. No abnormal anomalies were observed during dissection of the heart. The stomach contained blackish-brown colored fluid with an atypical smell. Therefore, the viscera were sent for chemical analysis to the regional forensic science laboratory. The results of the analysis confirmed the presence of aluminum phosphide poisoning, an organophosphate compound. This case of situs inversus with levocardia is a particularly rare and exceptional finding. The absence of any prior medical history of heart anomalies adds complexity to our understanding of this congenital anomaly. Such unique cases contribute significantly to our knowledge of situs inversus partialis and provide valuable insights for the medical community and forensic practitioners.

Discussion

Situs inversus, a rare congenital anomaly characterized by a mirror-image arrangement of thoracic and abdominal organs compared to the normal anatomical position known as situs solitus, presents a captivating anomaly in medical practice (Shogan and Folio 2011; Maldjian and

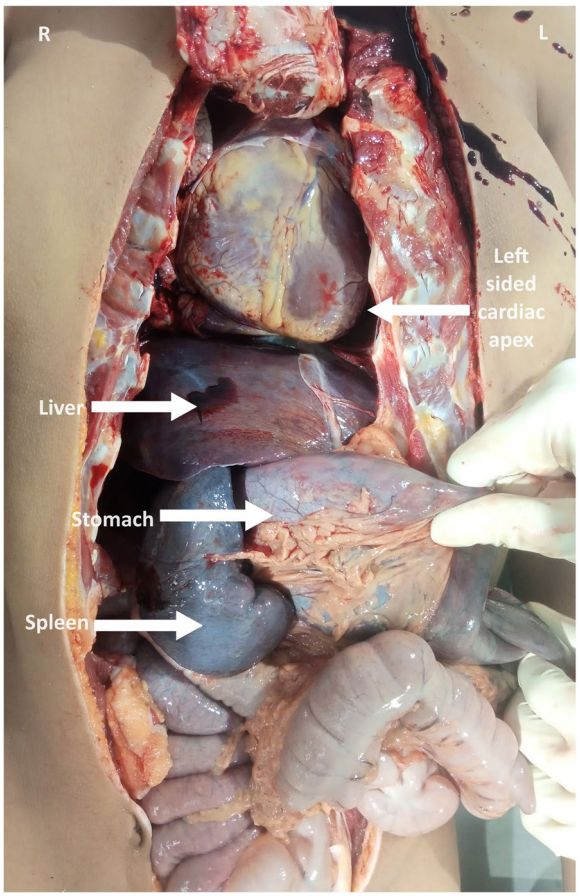

Fig. 2 Stomach is present over right side and it is lifted to show right sided spleen

Saric 2007; Fulcher and Turner 2002). Situs solitus refers to the standard orientation of organs, with the liver, left atrium, bilobed lung, stomach, spleen, and aorta located to the left of the midline and the liver, trilobed lung, and inferior vena cava situated to the right of the midline.

Divided into two categories, situs inversus encompasses situs inversus totalis, and situs inversus partialis. Situs inversus totalis, also known as situs inversus with dextrocardia, situs transversus, or oppositus, occurs in approximately one per 10,000 of the general population and involves the complete mirror image positioning of the chest and abdomen organs from situs solitus, including the apex of the heart pointing towards the right side (Shogan and Folio 2011; Maldjian and Saric 2007; Fulcher and Turner 2002; Eitler et al. 2022; Supriya et al. 2013). In contrast, situs inversus partialis, also referred to as situs inversus with levocardia, is a much rarer condition, affecting approximately one per 2,000,000 of the general population (Situs inversus 2023). Situs inversus with levocardia involves only the abdominal organs being mirror imaged, with the apex of the heart pointing towards the left side. Notably, individuals with situs inversus partialis often present with congenital heart disease. The term situs ambiguous is used to describe the arrangement of organs and vessels in an unordered manner (Maldjian and Saric 2007; Tonkin and Tonkin 1982).

An individual with situs inversus may often remain asymptomatic, with the anomaly being incidentally discovered during diagnostic investigations for unrelated health concerns. Failure to recognize the presence of situs inversus during diagnostic or therapeutic procedures can potentially lead to medical negligence and severe complications (Kanchan et al. 2013). Therefore, early detection of situs inversus is crucial as it can aid in the timely diagnosis of acute abdominal diseases, such as cholecystitis, acute appendicitis, or splenic injuries, and facilitate appropriate surgical planning (Chaouch et al. 2019; Enciu et al. 2022; Ding et al. 2022; Nagai et al. 2022). Diagnostic modalities such as X-ray, ultrasonography, computed tomography, or magnetic resonance imaging play pivotal roles in confirming the diagnosis of situs inversus.

The discovery of situs inversus with levocardia in this case is an extremely rare occurrence. Lack of any prior medical history related to heart anomalies complicates our understanding of this congenital anomaly. Cases with such distinct characteristics contribute significantly to expanding our knowledge of the situs inversus partialis, offering valuable insights for both the medical community and forensic practitioners. The knowledge gained from studying such rare anomalies contributes to improved patient care and enhanced medical knowledge, enabling healthcare professionals to make informed decisions and provide appropriate interventions to patients with situs inversus.

Conclusion

Situs inversus with levocardia (incompletus) remains an exceptionally rare and often overlooked condition, primarily because of limited medical awareness and its low incidence rate. The significance of such case reports lies in their contribution to the body of knowledge surrounding situs inversus, aiding in future research and medical education. By documenting and sharing these unique cases, we enhance our understanding of this intriguing congenital anomaly, paving the way for further studies and advancements in this field.

As exemplified by this case, the rarity of situs inversus with levocardia underscores the importance of continued vigilance and comprehensive diagnostic approaches in clinical practice. The early detection of such anomalies can prove critical in preventing potential surgical or therapeutic complications and ensuring optimal patient outcomes. Therefore, an increased focus on generating

more case reports and conducting etiological studies is warranted to refine our ability to diagnose situs inversus promptly and accurately.

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Declarations

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Consent for publication
All the authors approved the final version of this research and consented to publication.

Competing interests
The authors do not have any conflict of interest.

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