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Original Research Article

A study on the variations of arterial supply to adrenal gland

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Abstract

Introduction: Adrenal glands are richly vascular and get their arterial supply by means of three arteries namely superior, middle, inferior suprarenal arteries. The inferior phrenic artery gives off the superior branch, while middle branch arises directly from the abdominal aorta, and the inferior suprarenal branch is given off by the renal artery.
Materials And Methods: The study was conducted in 15 formalin fixed cadavers obtained from the department of Anatomy and are carefully dissected to observe the arterial supply of both right and left adrenal glands.
Observations: It has been noted that variations were observed in four cases out of 30 adrenal glands, two cases showed variations on right side and in two cases variation is seen on left side. First case on the right side, both MSA and ISA are given off by ARA. In the second case on right side IPA is given off by RA and from the junction of these two arteries MSA was given. In third case on left side MSA is given by the coeliac trunk and ISA is from ARA, in fourth case on left side ISA is originated from ARA.
Conclusion: A good understanding in the variation of adrenal gland vasculature is obligatory for a surgeon while performing adrenalectomy, kidney transplantations etc. and also for radiological arbitrations.
Keywords: Adrenal gland, Arterial supply, Adrenalectomy

1. Introduction

Adrenal glands are a pair of endocrine glands located in relation to the upper poles of kidney which secretes hormones that are essential to human life .Failure in the hormonal production will impair carbohydrate metabolism and unstable the electrolytes that will result in circulatory collapse, hypoglycaemic coma and death[1]. Hence these glands are richly vascular in nature and are supplied by three arteries namely superior, middle and inferior suprarenal arteries which are given off by inferior phrenic branch of AA, Abdominal aorta and renal arteries (occasionally accessory renal arteries) respectively. Although variations in the framework of adrenal gland vasculature is common [2]. Awareness of these variations are much needed for a nephrologists as preoperative vascular judgement is compulsory while performing surgical and radiological activities [3,4]. Thus the present effort is to study the variations in the arterial pattern of adrenal gland.

2. Materials and Methods

This study is performed in the Anatomy department, RKDF Medical College, Hospital and Research Centre, Bhopal by symmetrically dissecting 15 formalin preserved cadavers to trace the arterial supply of the adrenal gland. For easy demarcation of the arteries red paint is applied and the photographs of specimens were taken using digital camera. Variations are delineated in the tabular form.

3. Observations and results

Observations of the present work as depicted in Table no 1.were

SSA is given off by the inferior phrenic branch on both sides in 100% of the cases.

MSA- Right side- 83.33%, from AA, 13.33% from ARA and from the junction of IPA and RA in 3.33% of cases, **Left side** 96.66% is from AA and 3.33% from CT.

ISA -Right side- 83.33%, from RA, 16.66% from ARA, **Left side** 66.66% from RA and 33.33% from ARA.

Variations are observed in **four cases out of 30** while normal arterial pattern is seen in rest of the cases.

Case no 1- IPA gives off two twigs of SSA while MSA and ISA were given off by the ARA on right side (**Figure 1)**

Case no 2- IPA arises from RA which gives off SSA, ISA comes from RA whereas MSA is given at the junction of RA and IPA on right side.(**Figure 2)**

Case no 3- SSA is given off by IPA, MSA comes from celiac trunk, and ISA is given off by ARA on left side. **(Figure 3)**

Case no 4-SSA comes from IPA, MSA is from AA while ISA is given by ARA on left side **(Figure 4)**

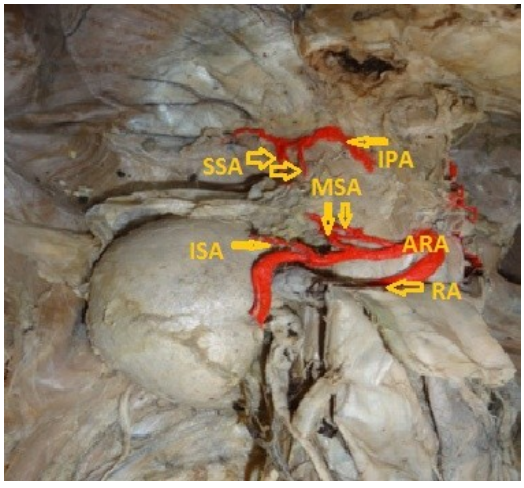

Figure 1: IPA gives off two twigs of SSA while MSA and ISA were given off by the ARA on right side

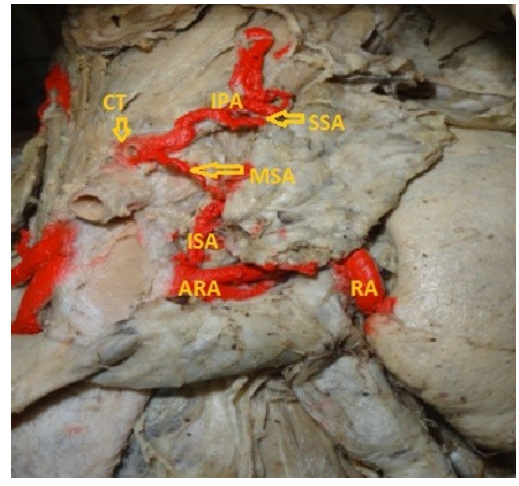

Figure 3: SSA is given off by IPA, MSA comes from celiac trunk, ISA is given off by ARA on left side.

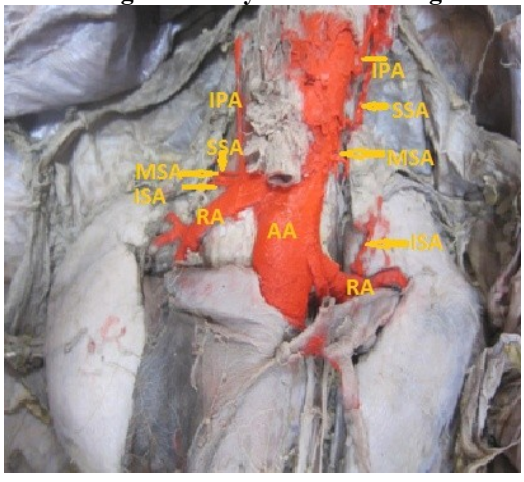

Figure 2: IPA arises from RA which gives off SSA; ISA comes from RA whereas MSA is given at the junction of RA and IPA on right side

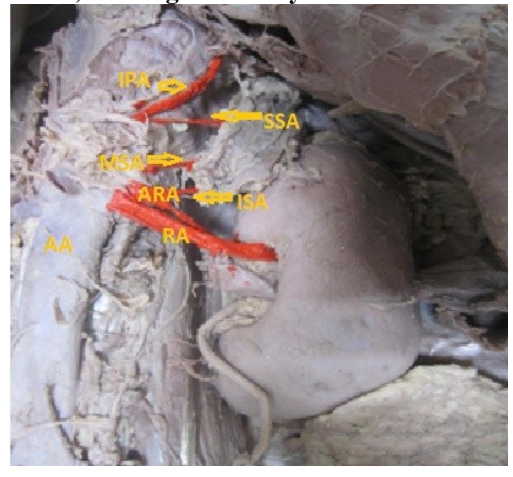

Figure 4: SSA comes from IPA, MSA is from AA while ISA is given by ARA on left side

Abbreviations: IPA: Inferior Phrenic Artery; **AA:** Abdominal Aorta; **RA:** Renal Artery; **ARA:** Accessory Renal Artery; **SSA:** Superior suprarenal artery; **MSA:** Middle suprarenal artery; **ISA:** Inferior suprarenal artery; **CT:** Coeliac Trunk; **RS:** Right side; **LS:** Left side

Table 1:

	SSA	MSA	ISA
Right Side	100% IPA(30)	83..33%AA (25)	83.33% RA (25)
		13.33% ARA (4)	16.66% ARA (5)
		3.33% Junction of RA and IPA (1)	
Left Side	100% IPA(30)	96.66% AA (29)	66.66% RA (20)
		3.33% CT (1)	33.33% ARA (10)

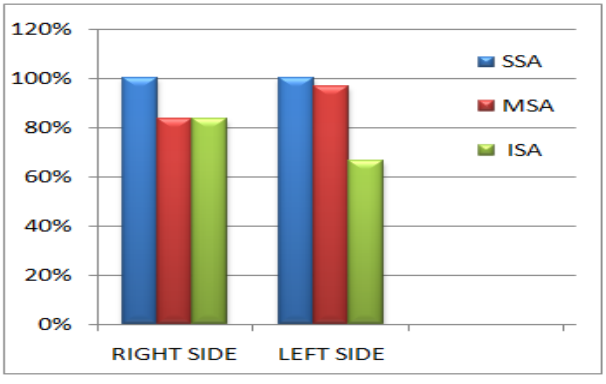

Figure 5: Bar diagram 1 showing Normal % of the Origin of SSA, MSA, ISA

SSA: 100%, **MSA:** 83.33% on RS, 96.66% on LS; **ISA:** 83.33% on RS, 66.66% on LS

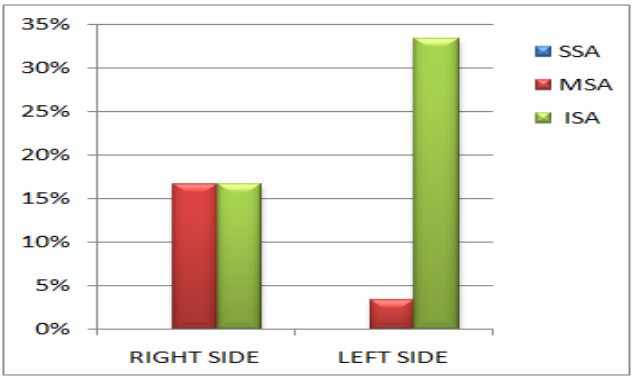

Figure 5: Bar diagram 2 showing % of variation in the Origin

SSA: 0%; **MSA:** 16.66% on RS, 3.33% on LS; **ISA: 16.66% on RS, 33.33% on LS**

4. Discussion

Adrenal gland shows complexity in its blood supply and variability in the origin and the position of arteries supplying them [5]. The lateral splanchnic branches of Dorsal aorta forms rete arteriosum urogenitale from which adrenal glands, kidneys and gonads draw their arterial supply [6]. The other sources of origins of arteries to adrenal gland involve left gastric, superior mesenteric and spermatic arteries [7].

Generally the superior suprarenal artery arises from the inferior phrenic artery [8] which is a branch from abdominal aorta. In the present study all the 30(100%) cases showed the normal origin of SSA that is from IPA.

MSA usually arises from AA but can also be originated from IPA, CT, RA, ARA[3] and plays a vital role in the supply of adrenal glands[9] Toni *et al* stated that MSA on right side was provided by AA in 91%, from coeliac trunk in 4%, from IPA in 3% and from RA in 2% of cases (rarest pattern) and on the left side it is originated from AA in 99% and form Coeliac trunk in 1% of cases[10]. In the present work in one case on the right side IPA has come from the RA. At the junction of these two MSA was given off. One case on left showed the origin of MSA from CT.

ISA is commonly derived from RA but can also be given off by AA, ARA, Gonadal artery and occasionally from the CT [2]. Bordei and his co workers reported three ISA among 6.6% of their cases [11]. Present study has disclosed the common origin of IPA from RA in most of the cases and in few it is from ARA.

The arteriograms of ISA are crucial in the description of adrenal gland tumours as per Rossi et al. Though the multiplicity, calibre and the variability carry greater difficulty in the adrenal gland arteriography[12].

5. Conclusion

The present work deals with detailed arterial architecture of adrenal gland and is compared with the earlier studies which can assist surgeons for preoperative judgement of vasculature while administrating surgical procedures like adrenalectomy, kidney transplantations etc and also for radiological evaluations.

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