# MORPHOLOGICAL ANALYSIS OF ARTERIAL SUPPLY OF PANCREAS AND VARIATIONS OF DORSAL PANCREATIC ARTERY



## THESIS

Submitted to

All India Institute of Medical Sciences, Jodhpur In partial fulfillment of the requirement for the degree of

# DOCTOR OF MEDICINE (MD) (RADIOLOGY)

JULY, 2020 AIIMS, JODHPUR **DR. SHAURYA SHARMA** 

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#### CERTIFICATE

This is to certify that the thesis titled "MORPHOLOGICAL ANALYSIS OF ARTERIAL SUPPLY OF PANCREAS AND VARIATIONS OF DORSAL PANCREATIC ARTERY" is the bonafide work of Dr. SHAURYA SHARMA carried out under our guidance and supervision, in the Department of Diagnostic and Interventional Radiology, All India Institute of Medical Sciences, Jodhpur.

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## **DECLARATION**

I hereby declare that thesis entitled "MORPHOLOGICAL ANALYSIS OF ARTERIAL SUPPLY OF PANCREAS AND VARIATIONS OF DORSAL PANCREATIC ARTERY" embodies the original work carried out by the undersigned.

Stramys

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## **ABBREVIATIONS**

CA	Celiac Artery
СНА	Common Hepatic Artery
СТ	Computed Tomography
СТА	Computed Tomography Angiography
DPA	Dorsal Pancreatic Artery
DSA	Digital Subtraction Angiography
DSAE	Distal Splenic Artery Embolisation
FOV	Field OF View
GDA	Gastroduodenal Artery
GEPA	Gastroepiploic Artery
GPA	Greater Pancreatic Artery
IPDA	Inferior Pancreaticoduodenal Artery
KVP	Kilovoltage Peak
MDCT	Multidetector Computed Tomography
MIP	Maximum Intensity Projection
MRI	Magnetic Resonance Imaging
MSCT	Multislice Computed Tomography
PD	Pancreaticoduodenenctomy
PSAE	Proximal Splenic Artery Embolization
RHA	Right hepatic artery
SA	Splenic Artery
SCT	Stem Cell Transplant
SMA	Superior Mesenteric Artery
SPDA	Superior Pancreaticoduodenal artery
SSD	Surface Shaded Display
TPA	Transverse Pancreatic Artery

## ABSTRACT

## "MORPHOLOGICAL ANALYSIS OF ARTERIAL SUPPLY OF PANCREAS AND VARIATIONS OF DORSAL PANCREATIC ARTERY"

The complexity of arterial supply of pancreas is the result of a multitude of arteries supplying it, namely splenic artery, gastroduodenal artery and superior mesenteric artery. The dorsal pancreatic artery, classically considered a branch of proximal third of splenic artery, is a major artery supplying the body and tail of pancreas, with contribution to the head and neck region as well. The purpose of the study was to investigate the variations in prevalence, origin and size of Dorsal Pancreatic artery (DPA) and its uncinate branch, and classify arcades supplying the pancreatic body and tail from Splenic artery according to the Roman Ramos et al classification. An analysis of 747 MDCT scans was performed in patients who underwent triple-phase or dual-phase CT abdomen, excluding those with a history of previous pancreatic surgery and significant image degradation. The DPA was visualised in 65.3% of patients (n = 488). The most common origin was from splenic artery (58.2%, n = 284) followed by direct origin from superior mesenteric artery (20%, n = 98)and common hepatic arteries (9.4%, n = 46), and a mean calibre of 2.05 mm (range = 1.0 -4.8 mm). The uncinate branch was seen in 21.7% (n = 106) of those with DPA present, with an average diameter of 1.3 mm. Arcades from branches of splenic artery were visualised in 16.2% of the patients (n = 121), predominantly of Roman Ramos Type 2 (short and long branches), seen in 52.1% (n = 63). Significant variations in anatomy of DPA, its branches and pancreatic arterial arcades from the splenic artery mandate appropriate evaluation before any surgical and endovascular procedure of pancreas can be undertaken.

## **INTRODUCTION**

The arterial supply of pancreas is a complex conundrum, with its various parts receiving blood supply from branches and arcades formed by multiple major abdominal aortic branches. The main supply of pancreas comes from branches of splenic artery and superior mesenteric arteries.

Pancreas is anatomically divided into a head, neck, body and tail. Embryologically it develops from outpouchings of the duodenum, called as the ventral and duodenal buds, which rotate and fuse around the 7<sup>th</sup> week of gestation to form the final form of the gland. <sup>[1]</sup> Embryologically considered a foregut-derived organ, pancreas received vascular supply from both primitive foregut and midgut arteries. <sup>[2]</sup> The primitive intestinal arteries also called as the ventral vitelline arteries form the enteric vasculature, with the 10<sup>th</sup> and 13<sup>th</sup> vitelline arteries giving rise to CA and SMA, respectively. <sup>[3]</sup>

In a surgical context, the pancreas can be divided into proximal and distal anatomical segments, which include the pancreatic head and uncinate process, and pancreatic body and tail respectively.

#### **Arterial supply of the Pancreas**

The celiac trunk, classically arising at the level of T12 vertebral body, is the main arterial supply of the foregut derived structures, namely distal esophagus to second part of duodenum, spleen, liver, gall bladder and pancreas. It gives out the left gastric branch, and then divides into its terminal branches, specifically the splenic and common hepatic arteries. <sup>[4]</sup> The common hepatic artery branches off the right gastric artery, which ascends along the lesser curvature of stomach and anastomoses with left gastric artery. The CHA further bifurcates into its terminal branches, gastroduodenal artery which descends along the posterior aspect of first part of duodenum, and the proper hepatic artery. The gastroduodenal artery terminates into the right gastroepiploic artery and superior pancreaticoduodenal artery. The proper hepatic artery further bifurcates into right and left hepatic arteries.

The splenic artery traverses along the superior margin of pancreas and terminates into its terminal splenic branches. It gives multiple important pancreatic feeders along its course,

namely dorsal pancreatic artery, greater pancreatic artery and caudal pancreatic arteries; short gastric arteries along the gastrosplenic ligament, and left gastroepiploic artery, which anastomoses with right gastroepiploic branch of gastroduodenal artery along the greater curvature of stomach.

The superior mesenteric artery, the other main artery supplying pancreas, arises from aorta at L1 level, and gives off inferior pancreaticoduodenal artery, jejunal and ileal branches, right colic, middle colic and ileocolic arteries. <sup>[5]</sup>

The anterior and posterior pancreaticoduodenal arcades, which are made up of branches of the gastroduodenal artery and superior mesenteric artery, provide the majority of the arterial supply for the head and uncinate process of the pancreas. The body and tail of pancreas, in turn, are supplied by multiple branches from the splenic artery, and the dorsal pancreatic artery. (**Figure** 1 demonstrates the arterial supply of pancreas)



Figure 1: Arteries supplying the pancreas :Arrows - Black – Celiac Artery (CA), Blue – Common Hepatic Artery (CHA), Green - Proper Hepatic Artery, Orange – Gastroduodenal Artery (GDA), Red – Posterior superior pancreaticoduodenal artery (PSPDA), Purple – Anterior superior pancreaticoduodenal artery (ASPDA), Grey – Splenic Artery (SA), Yellow – Dorsal pancreatic artery (DPA), Blue dotted – Anterior Inferior pancreaticoduodenal artery (AIPDA), Yellow dotted – Posterior inferior pancreatic artery (TPA), Black dotted – Right branch of Dorsal pancreatic artery, Green Dotted – Transverse pancreatic artery (TPA), Black dotted – Splenic branches, Orange dotted – Caudal Pancreatic Arteries, Purple dotted – Inferior pancreaticoduodenal artery (IPDA). {Concept: Rousek M et al, 2022, Drawn by self}

#### Anatomy of the Dorsal Pancreatic Artery

The Dorsal pancreatic artery (DPA) is the first branch that emerges from the Splenic artery (SA), if one exists. It has the widest range of variation, among the pancreatic arteries. <sup>[6]</sup> The dorsal pancreatic artery has been defined as a branch of the splenic artery that arises from the proximal one-third of the splenic artery and descends along the posterior margin of the pancreas where it divides into left and right branches. With a wide spectrum of parent vessel from which it originates (**Figure** 2), it can be seen most commonly arising from the splenic artery, celiac axis, common hepatic artery, and superior mesenteric artery. The other rather rare points of origins include those from gastroduodenal artery, aberrant hepatic artery, middle colic artery, PIPDA, right gastroepiploic artery and first jejunal artery. <sup>[6]</sup> DPA typically has a diameter of between 1-3 mm but occasionally can be up to 1 cm wide.<sup>[7]</sup>

Running along the dorsal surface of pancreas, it turns into an inverted T bifurcation caudally, producing a right branch that, in 40% to 50% of cases, joins the posterior pancreaticoduodenal arcade and, more crucially, a left constant terminal branch: the transverse pancreatic artery (TPA). Romodanowskaja described the right branch, seen traversing inferiorly behind the body of pancreas, further anastomosing with a branch from the SMA. <sup>[8]</sup> Numerous authors have provided detailed descriptions of the right terminal branch which runs in front of or behind the superior mesenteric vein, horizontally in the direction of the pancreatic head. <sup>[6]</sup> It further gives off multiple variable secondary branches, namely uncinate branch, suprapancreatic branch and head branch. <sup>[9]</sup> The uncinate branch usually arises just after the right branch enters pancreatic parenchyma, and anastomoses with the pancreaticoduodenal arcades. Dissection studies revealed that the uncinate branch had an incidence of 60 - 80 % among overall occurrences of 88.8% DPA. <sup>[9, 10]</sup> The branch's calibre ranges from 0.2 mm to roughly 2 mm, and in around 80% of the patients, it was between 0.5 and 1.5 mm. It is well recognised that a large calibre has a significant impact on venous congestion during pancreaticoduodenectomies. <sup>[10]</sup>

The transverse pancreatic artery, which travels towards the tail of the pancreas often along the inferior border of the body, is considered the left terminal branch of the DPA. <sup>[11]</sup> The inferior aspects of pancreatic neck, body, and tail are supplied by the TPA. <sup>[7]</sup>

The structural differences of the DPA and any potential circulatory effects it may have on the pancreatic tail should be known prior to undertaking surgical procedures. This could help identify an inadvertent injured DPA on table, which might favor a successful transplant and prevent endangering the pancreatic allograft during procurement process.<sup>[7]</sup>

In cases of splenic blunt trauma, particularly in those with AAST grade IV-V splenic injuries, patients with significant AAST grade III-V splenic injury are typically treated with auxiliary splenic artery embolization (SAE), which is linked to higher spleen salvage and lower non-operative management failure rates. SAE can be carried out proximally or distantly. Selective embolization of branches distal to the hilum constitutes distal splenic artery embolization (DSAE). In Proximal Splenic Embolization (PSAE), the major splenic artery is embolized (SA). When compared to the other two locations— before the DPA and after the GPA—the hypothesised best position for embolization as between the DPA and GPA is found to have better clinical and technical success with significantly improved splenic perfusion. Hence, variation in anatomy of the same plays an important role. <sup>[12]</sup>

A difficult surgical procedure for the treatment of pancreatic head and periampullary cancers is pancreatoduodenectomy (PD). With conventional PD, the inferior pancreaticoduodenal artery (IPDA) is ligated after the pancreatic head is removed from the superior mesenteric vein (SMV). This surgery results in severe venous congestion and bleeding from the pancreatic head's resected surface. An artery first approach was devised which could lead to a reduction in blood loss and vascular congestion, by dividing the IPDA in the earlier segment of the surgery. Recent studies have also concluded, with a mesenteric approach, early DPA ligation during pancreaticoduodenectomy may lessen intraoperative blood loss. <sup>[13]</sup>

One of the rather unusual and rare occurrences of DPA involvement occur in cases of postpancreaticoduodenectomy pseudoaneurysm formation, especially in cases where there is arterial occlusion by the mass leading to extensive collateralisation and pseudoaneurysm formation. Such patients are at risk for life-threatening hemorrhage, hence early ligation or endovascular management is mandated. A detailed anatomy of the artery would provide a necessary roadmap for further interventions. <sup>[14]</sup>

#### Key definitions used in the study:

**Dorsal pancreatic artery (DPA):** The dorsal pancreatic artery is a branch of the splenic artery that originates from the proximal one-third of the splenic artery. <sup>[15]</sup>

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**Greater pancreatic artery (GPA):** The greater pancreatic artery (arteria pancreatica magna) is a branch of the splenic artery that originates from distal splenic artery and supplies distal body and tail area. <sup>[15]</sup>

Uncinate process branch: Branch originating from the DPA, coursing towards the uncinate process.



Figure 2: Schematic diagrams showing various origins of the Dorsal Pancreatic Artery (DPA – red arrow in each) – A: from Splenic Artery (SA) – Yellow Arrow, B: from Common Hepatic Artery (CHA) – Black arrow, C: from Gastroduodenal artery (GDA) – Blue arrow, D: from Superior mesenteric artery (SMA) – purple arrow and E: from Celiac Artery (CA) – pink arrow {Concept: Rousek M et al, 2022, Drawn by self}

# Arterial supply of distal pancreas and the intrapancreatic arterial arcade classification

A more precise way of classifying the arterial supply of distal pancreas includes superior and inferior aspects of body, supplied by the Dorsal Pancreatic artery (DPA) and greater pancreatic artery (GPA), with tail of pancreas being further divided into inferior half of tail, supplied by Transverse pancreatic artery (TPA) and Greater pancreatic artery (GPA), superior half and terminal end of tail, supplied by the caudal pancreatic arteries. <sup>[15]</sup> Most of these are primarily the branches of the splenic artery, which constitute of short and long branches, with the latter including the DPA and GPA. Small vessels that emerge from the splenic artery as it travels down the pancreas, feeding its body and tail, are referred to as short pancreatic branches. <sup>[15]</sup> These branches show formation of arcades and anastomoses, with subsequent branches supplying the pancreatic body and tail. R. Roman Ramos et al <sup>[16]</sup> devised a classification system, to determine the type of branches involved in the formation of these arcades and perfusing the pancreas into the following types (**Figure 3**):

- 1. Small arcades (type I)
- 2. Small and large arcades (type II)
- 3. Large arcades (type III)
- 4. Straight branches (type IV)

This classification helps in deciding whether the pancreas can be considered a segmental organ, as large and extensive anastomoses are considered to be a contributory factors in difficulty of surgical resection and elevated bleeding risks during procedures. Additionally, it may be helpful in cases with intermediate/middle pancreatomy and the removal of smaller benign tumours. <sup>[17]</sup> In these circumstances, the existence of less obvious anastomoses might be advantageous since it permits less blood loss and lowers the risk of necrosis. **Figure 3** illustrates the classification and the various types.



Figure 3: Illustration depicting R. Roman Ramos and coworkers classification: Type I - Small Arcades, Type II - Small and Large arcades, Type III - Large arcades and Type IV - Straight branches only

#### **REVIEW OF LITERATURE**

**C.W.A Falconer et al** <sup>[18]</sup> **in 1950** conducted a prospective study in UK to evaluate the arterial supply of pancreatic region, using 50 anatomical specimens, including 27 dissections and 23 injection corrosion preparations. The superior pancreatic artery (an earlier terminology used for DPA) was evaluated. Out of the 27 dissection specimens, it was visualised in 22 specimens (81.5 % prevalence), with most common origins from splenic artery (n = 6) and common hepatic artery (n = 6).

**M** Chong et al <sup>[19]</sup> in 1998 conducted a cross sectional study in USA to assess the pancreatic arterial anatomy. Arterial phase helical CT (3 mm collimation, 1 mm reconstruction interval) of 87 technically satisfactory patients were reviewed. The DPA was recognised in 82 (94%) of the studies, with origins seen most frequently from splenic artery (n = 34, 41%) and SMA (n = 21, 26%). Right branch of DPA was only occasionally identified, in 8 (9%) patients. The left branch or the TPA was seen in 36 (41%) of the 8 patients.

Hong KC et al <sup>[20]</sup> in 1999 conducted a cross sectional study in USA to assess the pancreaticoduodenal arcades and DPA detection sensitivity of CT angiography utilising 3D volume rendering, maximum intensity projection (MIP), and shaded surface display (SSD) techniques. Dual phase helical CT of 27 patients were examined. The DPA was identified in 26 of the patients (96.3%). The study showed that the DPA has a variety of anatomic origins, including the celiac (n = 5), SA (n = 11), CHA (n = 2), and SMA (n = 8).

**Y. Shioyama et al** <sup>[21]</sup> **in 2001** conducted a prospective study in Japan to study peripancreatic arteries on thin section MSCT. 304 scans of patients without pancreatic disease and 22 patients with pancreatic carcinoma were evaluated by thin-section contrast enhanced CT of the abdomen. In 96% of cases, the DPA could be seen, while only 41% of cases showed the TPA.

**Ishigaki S. et al** <sup>[22]</sup> **in 2007** conducted a cross-sectional study in Japan for utilising CT to depict pancreatic head vascular supply. 45 multiphase MDCT scans were analysed for the presence of arterial branches supplying the pancreas. The superior mesenteric artery (n = 16), the splenic artery (n = 12), the common hepatic artery (n = 7), the right hepatic artery arising from the superior mesenteric artery (n = 3), the gastroduodenal artery (n = 2), the

celiac axis (n = 2), the first jejunal artery (n = 1), were the common parent arteries of origin of the DPA. This artery split into the transverse pancreatic artery and the right branch, both of whose beginnings were visible in 43 (96%) and 41 (91%) of the 45 individuals, respectively.

**Horiguchi A. et al** <sup>[23]</sup> **in 2008** conducted a prospective study in Japan. The depiction rate and branching of the pancreatic head arteries, the inferior pancreaticoduodenal artery (IPDA) and dorsal pancreatic artery (DPA), were examined. 109 patients served as the subjects, and MS-CT images of vascular architecture were obtained for each of them. The splenic artery had the highest frequency of branching of DPA in their MS-CT study, at 40%, followed by the common hepatic artery at 25.7%.

Lin Y. et al <sup>[24]</sup> in 2012 conducted a prospective study to understand arterial architecture of pancreas, in patients undergoing SCT to facilitate superselective infusion. CTA and DSA, respectively, detected 35 and 36 dorsal pancreatic arteries. In 5 individuals, neither a CTA nor a DSA could demonstrate the DPA.

Sakaguchi T. et al <sup>[25]</sup> in 2012 conducted a prospective study to identify the peripancreatic 3D-MDCT, for arterial ease of patients anatomy using undergoing pancreaticoduodenectomy. Peripancreatic arteries were three-dimensionally rebuilt using computer software in 166 patients undergoing multidetector-row computed tomography. The splenic artery (45.4%), common hepatic artery (24.8%), superior mesenteric artery (SMA, 15.6%), celiac axis (9.9%), and other arteries, including the middle colic artery (4.3%), were the parent arteries visualised, from which DPA was seen arising.

**Fang CH et al** <sup>[26]</sup> **in 2014** conducted a randomized, parallel, single-blinded study in China, to learn more about the clinical relevance of peripancreatic vessel reconstruction in three dimensions (3D) for people who may have pancreatic cancer. 60 of the 89 pancreatic cancer patients who were included underwent computed tomographic angiography at random. The DPA was detected in 91.6% of the cases. The 43 patients who underwent 3D reconstruction had better operating room times, blood loss, hospital stays, and complication rates than the rest of the patients.

**Macchi V. et al** <sup>[27]</sup> **in 2017** conducted a study in Italy to examine the anatomical basis of postoperative problems and to describe pancreatic vascularization. The spleen, retroperitoneal arteries, and other organs from ten un-embalmed cadaver specimens were

injected with acrylic resin to create vascular casts. Additionally, 30 CTAs (computed tomography angiographies) of individuals without pancreatic disease were examined. The splenic artery was found to be the source of the dorsal pancreatic artery in 38.5% of cases, the hepatic artery in 15.4%, the celiac trunk in 7.7%, and the superior mesenteric artery in 3.8%. The dorsal pancreatic artery had a mean calibre of 2.0 mm and was visible in 65.4% of cases. The great pancreatic artery had a mean diameter of 2.2 mm +/- 1.1 and was visible in 73.1% of cases.

**Iede K. et al** <sup>[13]</sup> **in 2018** conducted a prospective study in Japan to assess the variant anatomy of DPA and research the effects of early DPA ligation on clinical outcomes. 34 patients underwent MDCT preoperatively for estimating the variations of DPA. The SMA was the source of the DPA in 10 patients (29%), followed by the CHA in 8 patients (24%), and the SA in 7 patients (21%). Three patients (9%) had double origins with communicating blood flow, which were found at the CHA-SMA, SA-SMA, and CA-SMA, respectively.

**T. Tatsuoka et al** <sup>[10]</sup> **in 2019** conducted a descriptive study in Japan to study the importance of DPA in the artery-first strategy during PD by first examining the architecture of DPA and its branches to the uncinate process using the currently available high-resolution dynamic computed tomography (CT). 160 consecutive patients who were proposed to undergo pancreatic surgery were given preoperative dynamic thin-slice CT scans, and the architecture of the DPA and its branches to the uncinate process was investigated. DPA was identified in 103 individuals (64%); it came from the superior mesenteric artery or its branches in 34 patients, and the celiac axis or its branches in 70 patients. Regardless of where the DPA originated, the branches to the uncinate process were visible in 82 individuals (80%), with calibre of 0.5–1.5 mm.

**Covantev S. et al**<sup>[15]</sup> **in 2019** conducted a prospective study in Moldova to study the arterial supply of distal part of pancreas. Macroscopical dissection and corrosion cast techniques were used in the investigation. There were 72 organ blocks in all (50 for dissection and 22 for corrosion cast). Roman Ramos and colleagues' categorization was used to examine the 22 corrosion cast specimens. Small arcades made up type I in nine cases (40.90%), small and big arcades (type II) in seven (31.82%), large arcades (type III) in five (22.73%), and straight branches (type IV) in one (4.55%) example.

**Jiang CY. Et al** <sup>[28]</sup> **in 2021** conducted an anatomical and radiological case controlled study in China. For the purpose of assessing the pancreatic head's blood supply, thirteen Chinese cadaveric specimens and computed tomography was used as a preoperative identification of the DPA in a total of 35 consecutive patients. 17 patients (the "early DPA ligation" group) had their DPAs ligates before having their uncinate processes dissected; everyone else was placed in the control group. All thirteen specimens showed presence of the DPA, and the results revealed a mean diameter of 3.5 mm. The splenic artery (SA) (n = 6, 46.1%), the SMA (n = 5, 38.5%), the common hepatic artery (n = 1, 7.7%), and the right gastroepiploic artery (n = 1, 7.7%) constituted the origins of DPA. The DPA split into two branches: the left branch, which had a mean diameter of 2.9 mm and the right branch, which had a mean diameter of 3.6 mm. The summary of review of literature has been highlighted in Table 1.

## Table 1: Summary of review of literature

AUTHOR NAME	COUNTRY	YEAR	STUDY	RESULTS
			DESIGN	
C.W.A Falconer et al	UK	1950	Prospective	DPA visualised in 81.5 % cases,
[18]				with most common origins from
				splenic artery $(n = 6)$ and common
				hepatic artery $(n = 6)$ .
M Chong et al <sup>[19]</sup>	USA	1998	Cross-	DPA was recognised in 94% of the
			Sectional	studies, most common origin from
				splenic artery and SMA. Left
				branch was visualised in a majority
				of cases, compared to the right
				branch.
Hong KC et al <sup>[20]</sup>	USA	1999	Prospective	The DPA was identified in 96.3%
				patients on CT abdomen. A variety
				of anatomic origins, including the
				celiac (n = 5), SA (n = 11), CHA
				(n = 2), and SMA $(n = 8)$ were
				recognized.
Y. Shioyama et al <sup>[21]</sup>	Japan	2001	Prospective	Detection rate of DPA on MSCT
				was 96%, the DPA could be seen,
				while only 41% of cases showed
				the TPA.
Ishigaki S. et al <sup>[22]</sup>	Japan	2007	Cross	45 multiphase MDCT scans
			Sectional	showed origins of DPA from
				SMA ( $n = 16$ ), the splenic artery ( $n$
				= 12), CHA (n = 7), RHA (from
				SMA) (n = 3), GDA (n = 2), and
				others. The transverse pancreatic
				artery and the right branch, both of
				whose origins were visible in 43

				(96%) and 41 (91%) of the 45
				individuals, respectively.
Horiguchi A. et al <sup>[23]</sup>	Japan	2008	Prospective	109 MS-CT images revealed SA to
				be the artery of origin of DPA in
				40%, followed by the CHA in
				25.7%.
Lin Y. et al <sup>[24]</sup>	China	2012	Prospective	CTA and DSA, respectively,
				detected DPA in 35 and 36 dorsal,
				out of the total 41 cases.
Sakaguchi T. et al <sup>[25]</sup>	Japan	2012	Prospective	MDCT studies in 166 patients
				revealed the most common origin
				of DPA from SA (45.4%), CHA
				(24.8%), SMA (15.6%) and CA
				(9.9%).
Fang CH et al <sup>[26]</sup>	China	2014	Prospective	The DPA was detected in 91.6% of
				60 total cases. Pre-operative 3D
				reconstruction showed better
				operating room times, blood loss,
				hospital stays, and complication
				rates than the rest of the patients.
Macchi V. et al <sup>[27]</sup>	Italy	2017	Prospective	SA was found to be the source of
				the DPA in 38.5% of cases, CHA
				in 15.4%, CA in 7.7%, and SMA
				in 3.8%. Mean calibre of DPA was
				2.0 mm. The GPA had a mean
				diameter of 2.2 mm +/- 1.1 and
				was seen in 73.1% of cases.
Iede K. et al <sup>[13]</sup>	Japan	2018	Prospective	MDCT scans of 34 patients
				showed SMA as the source of the
				DPA in 10 patients (29%),
				followed by CHA in 8 patients
				(24%), and SA in 7 patients (21%).
				Double origins were seen in 3
				cases, from the CHA-SMA, SA-
				SMA, and CA-SMA.

T. Tatsuoka et al <sup>[13]</sup>	Japan	2019	Prospective	160 dynamic thin slice CT studies
				revealed DPA in 103 individuals
				(64%); with origins from SMA or
				its branches in 34 patients, and the
				CA or its branches in 70 patients.
				The uncinate process branch was
				visible in 82 individuals (80%),
				with calibre of 0.5–1.5 mm
Covantev S. et al <sup>[10]</sup>	Moldova	2019	Prospective	Roman Ramos and colleagues'
				categorization was used to
				examine 22 corrosion cast
				specimens. Small arcades made up
				type I in nine cases (40.90%),
				small and big arcades (type II) in
				seven (31.82%), large arcades
				(type III) in five (22.73%), and
				straight branches (type IV) in one
				(4.55%) example.
Jiang CY. Et al <sup>[28]</sup>	China	2021	Prospective	DPA was seen in all cases with a
				mean diameter of 3.5 mm. The
				splenic artery (SA) (46.1%), the
				SMA (38.5%), the common
				hepatic artery (7.7%), and the right
				gastroepiploic artery (7.7%) were
				the most common origins. the left
				branch had a mean diameter of 2.9
				mm while the right branch's mean
				diameter was 3.6 mm.

## AIMS AND OBJECTIVES

- 1. To study the anatomy and variations in the origin of the dorsal pancreatic artery and greater pancreatic artery
- 2. To study the arterial arcades supplying the pancreatic parenchyma

## **MATERIAL AND METHODS**

### **STUDY DESIGN:** Prospective study

**SAMPLE SIZE:** The study involved a time bound sample size. All the consenting patients visiting the department of who fulfilled the inclusion criteria within the time period between December, 2020 to October 2022 were included in the study.

**STUDY GROUP:** Patients who underwent abdominal CT at the Department of Diagnostic and Interventional Radiology of All India Institute of Medical Science (AIIMS), Jodhpur, who fulfilled the following criteria were enrolled in this study. A total number of (747) were included in the study.

#### **INCLUSION CRITERIA**

1. Patients undergoing triphasic abdominal CT or abdominal CT angiography.

#### **EXCLUSION CRITERIA**

1. Previous pancreatic surgery

#### **CT SCANNERS:**

- Siemens Somatom Definition Flash Dual Energy 128\*2 Slice Multi Detector CT Scanner (Siemens Healthcare GmbH, Germany).
- Siemens Somatom Drive Dual Energy 128\*2 Slice Multi Detector CT Scanner (Siemens Healthcare GmbH, Germany).

**SAMPLE SIZE CALCULATION:** Tatsuoka et al have found existence of DPA in 64% of cases. Using this for sample size calculation, we estimated a sample size of 239 cases at a 95% Confidence interval (CI) and 10% relative precision.

**ETHICAL CONSIDERATIONS:** This study was conducted after approval from Institutional Ethics Committee.

#### **CT Examination Protocols**

**Triple Phase CT:** Triple phase CT scans were acquired on Siemens Somatom Definition Flash 128 x 2 Dual-source CT scanner (Siemens, Germany) and Siemens Somatom Drive Dual Energy 128 x 2 Slice Dual-source CT Scanner (Siemens, Germany). 100 ml of nonionic iodinated contrast material (Contrapaque, iodine concentration, 350 mg/ml) was injected through an 18-to 20-gauge antecubital intravenous cannula at a rate of 4 ml/s. Scans were acquired in triple phase protocol - hepatic arterial, portal venous and hepatic venous phase using a Smart Prep Protocol with enhancement threshold set at 100 HU. Examination parameters were 0.5 s rotation time, FOV 500 mm, matrix of  $512 \times 512$ , pitch value of 0.6, 0.75 mm section thickness, 3 mm reconstruction interval, 100-120 kVp with Care Dose reference mAs 290. Additional images were reconstructed with 0.5 mm reconstruction intervals for detailed interpretation.

**CT** abdominal angiography: **CT** Abdominal Angiographies were acquired on Siemens Somatom Definition Flash 128 x 2 Dual-source CT scanner (Siemens, Germany) and Siemens Somatom Drive Dual Energy 128 x 2 Slice Dual-source CT Scanner (Siemens, Germany). 100 ml of non-ionic iodinated contrast material (Contrapaque, iodine concentration, 350 mg/ml) was injected through an 18-to 20-gauge antecubital intravenous cannula at a rate of 4 ml/s. Scans were acquired in triple phase protocol —arterial phase using a Smart Prep Protocol with enhancement threshold set at 100 HU. Examination parameters were 0.5 s rotation time, FOV 500 mm, matrix of 512 × 512, pitch value of 0.6, 0.75 mm section thickness, 3 mm reconstruction interval, 100–120 kVp with Care Dose reference mAs 290. Additional images were reconstructed with 0.5 mm reconstruction intervals for detailed interpretation.

## **CT Interpretation**

The CT interpretation was performed by two radiologists (BS, SS 20 and 2 years of experience respectively). The radiologists were aware about the clinical and radiological diagnosis of the patients while interpreting the CT.

#### The parameters assessed included:

### SECTION 1: DORSAL PANCREATIC ARTERY

PRESENT? (YES/NO)	
SINGLE/MULTIPLE (NUMBER)	
ORIGIN	
CALIBRE (in mm)	

### SECTION 2: GREATER PANCREATIC ARTERY

PRESENT? (YES/NO)	
ORIGIN	
CALIBRE (in mm)	

### SECTION 3: TYPE OF ARCADE (Roman Ramos Classification)

TYPE OF ARCADE	

### SECTION 4: UNCINATE PROCESS BRANCH OF DPA

PRESENT? (YES/NO)	
CALIBRE	

#### Statistical analysis

Microsoft Excel, version 16.68 (Microsoft Corporation. Ltd, Washington, USA) was used for statistical analysis. All nominal data were described in frequencies and percentages. Descriptive statistics were given as mean (minimum–maximum).

## **OBSERVATIONS AND RESULTS**

A total of 747 patients were included in the study, after appropriate selection through the initially decided inclusion and exclusion criteria.

### **Patient Demographics**

The total of 747 patients included 73% male (n = 544) and 27% female (n = 203) patients. The average age of the study group was 49 years, ranging from a minimum of 1 year and maximum age of 91 years. **Table** 2 highlights the gender distribution of the study population.

## **Table 2: Gender distribution of patients**

(n=747)	Distribution
Males	544 (73%)
Females	203 (27%)

### Variations in anatomy of DPA

The DPA was visualised in 488 (65.3%) of the patients, while it was not visualised in the 259 remaining patients (34.7%). A single DPA was visualised in most of the patients (n = 484, 99.1%) while double origin of the DPA was seen in 4 patients. **Table 3** depicts the prevalence of DPA.

### Table 3: Prevalence of DPA

(n=747)	Distribution
DPA visualised	488 (65.3%)
DPA not visualised	259 (34.7%)

A variety of origins of the artery were visualised, with the most common origin from the SA alone (n = 284, 58.2%). The other common origins included main trunk of SMA (n = 98, 20%), CHA (n = 46, 9.4%) and CA (n = 29, 5.9%). Branches of SMA also contributed to origin of the DPA, with DPA arising from IPDA in 10 cases (2.1%), replaced RHA in 4

cases (0.82%) and jejunal branch of SMA in 4 cases (0.82%). Right gastroepiploic artery in 1 case (0.2%) was the parent artery of DPA.

In 2 rare cases (0.41%), the DPA was seen arising directly as a branch of abdominal aorta. The double origins were seen in 4 cases, were labelled as SA-CHA (n = 1, 0.2%), SA-SMA (n = 1, 0.2%), SA-IPDA (n = 1, 0.2%) and SA-replaced RHA (n = 1, 0.2%). Figure 4 contains a bar graph depicting the various parent arteries of the DPA.

The uncinate branch of DPA was seen in 106 (21.7%) out of the total 488 cases showing DPA.



Figure 4: Graph depicting distribution of various arteries of origin of the Dorsal pancreatic artery
(DPA) [AA – Abdominal aorta, CA – Celiac Artery, IPDA – Inferior pancreaticoduodenal artery, SA
– Splenic artery, SMA – Superior mesenteric artery, RHA – right hepatic artery, CHA – common hepatic artery, GEPA – gastroepiploic artery, GDA – gastroduodenal artery, SMA (J) – jejunal branch of SMA)

#### Morphometric analysis of DPA and its uncinate branch

Average diameter of DPA measured just distal to its origin was found to be 2.05 mm, with a range of 1 mm to 4.8 mm.

The average calibre of the uncinate branch was measured to be 1.3 mm, ranging from 0.8 to 3 mm.

#### Pancreatic arcades according to Roman Ramos et al classification

The pancreatic arcades from branches of splenic artery were divided into 4 types according to the classification system proposed by Roman Ramos et al, based on their studies on anatomical specimens. In our study, these arcades were visualised in 121 patients (16.2%) of the total 747 sample size. Out of these, the most common type of arcade was found to be type II, seen in 52.1% of the patients (n = 63). It was followed by type III (n = 31, 25.6%) and type I (n = 27, 22.3%). The type IV, which included only multiple straight branches supplying the body and tail of pancreas, without forming arcades, was not seen. **Figure 5** demonstrates the distribution of the types of arcades visualised.



Figure 5: Pie chart depicting frequency of type of pancreatic arcade according to Roman Ramos et al classification

### Anatomic variations of the Greater Pancreatic artery

The greater pancreatic artery was seen in 57.3% of the cases (n = 428) while in the rest of the 42.7% cases (n = 319), it could not be visualised. It was predominantly seen arising from the splenic artery in 427 cases (99.8%), while only in 1 rare case it was seen arising from the left gastric artery. **Table 4** depicts the prevalence of greater pancreatic artery (GPA).

The average diameter of the GPA was calculated to be 1.7 mm, with a range of 0.8 - 3.1 mm.

(n=747)	Distribution
GPA visualised	428 (57.3%)
GPA not visualised	319 (42.7%)

### **Table 4: Prevalence of GPA**

DPA	Origin of DPA	Branch to the Uncinate Process	Calibre DPA	Uncinate Branch
Present (n = 488, 65.3%)		Present	2.05 mm	1.3 mm
	SA (n = 284, 58.2%)	(n = 106, 21.7%)	(1 mm to 4.8 mm)	(0.8 to 3 mm)
	SMA - main trunk (n = 98, 20%)			
	CA (n = 29, 5.9%)			
	CHA (n = 46, 9.4%)			
	GDA (n = 8, 1.64%)			
	Branches of SMA –			
	IPDA (n = 10, 2.1%)			
	Replaced RHA ( $n = 4, 0.82\%$ )			
	Jejunal branch ( $n = 4, 0.82\%$ )			
	Right gastroepiploic ( $n = 1, 0.2\%$ ).			
	Abdominal Aorta ( $n = 2, 0.41\%$ )			
	Dual Origins			
	CHA, SA (n = 1, 0.2%)			
	SA, Replaced RHA $(n = 1, 0.2\%)$			
	SA, SMA (n = 1, 0.2%)			
	CA, IPDA (n = 1, 0.2%)			
Absent $(n = 259, 34.7\%)$		Absent $(n = 382, 78, 3\%)$		

#### TABLE 5 SUMMARISES THE DORSAL PANCREATIC ARTERY (DPA) VARIANT ANATOMY.

 Table 5: Table summarising the variations of dorsal pancreatic artery and its uncinate branch. SA - Splenic artery, SMA - Superior mesenteric artery, CA - Celiac artery, GDA - gastroduodenal artery, CHA - common hepatic artery, IPDA - inferior pancreaticoduodenal artery, RHA – right hepatic artery

## DISCUSSION

A great deal of variations encompass the arterial supply of pancreas. Considering more and more operative, whether open, laparoscopic or robotic procedures, as well as interventions are being undertaken with respect to this organ, there is a continued desire for improvements in the patient outcomes. According to some recent studies, postoperative bleeding happens in 3%–13% of patients after pancreatic surgery. The type of resection appears to have an impact on the frequency of intraoperative or post-operative haemorrhagic complications. <sup>[29]</sup>

DPA is one of the overlooked but important arteries supplying pancreas. It has been described in the earlier studies, using various names, including superior pancreatic artery <sup>[30]</sup>, middle pancreatic artery <sup>[31]</sup>, proper pancreatic artery <sup>[32]</sup>, and main pancreatic artery <sup>[33]</sup>. It was in 1942, by Michels et al <sup>[34]</sup>, that the term "Dorsal pancreatic Artery/pancreatica dorsalis" was used to describe a sizable branch that typically arises from the aorta or celiac artery and is distributed to the dorsal surface of the pancreas. Many anatomical based studies have been performed prior to the advent of imaging studies, to describe the anatomy and variations in the anatomy of DPA. The prevalence of the dorsal pancreatic artery varied substantially amongst the studies, from 64.4% to 100%. <sup>[35]</sup> As per the metaanalysis done by Rousek M. et al <sup>[6]</sup>, the DPA arose as a branch of the coeliac trunk in 11.9% of cases, the splenic artery in 37.6% of cases, the common hepatic artery in 18.3% of cases and the superior mesenteric artery in 23.9% of cases. In our study, the DPA was found in 488 (65.3%) of the 747 patients that were included, with most common origins from the SA alone (n = 284, 58.2%), main trunk of SMA (n = 98, 20%), CHA (n = 46, 9.4%) and CA (n = 29, 5.9%).

With a cumulative pooled incidence of just 2.77%, other sources were uncommon. The right gastric artery, the right gastroepiploic artery, the inferior pancreatic artery, and the first jejunal artery were among them. Also included were aberrant hepatic arteries, the gastroduodenal artery, the middle colic artery, the posterior inferior pancreaticoduodenal artery, and the right gastric artery. In our study, these rarer origins included the IPDA in 10 cases (2.1%), replaced RHA in 4 cases (0.82%), jejunal branch of SMA in 4 cases (0.82%), right gastroepiploic artery in 1 case (0.2%) and abdominal aorta in 2 cases (0.41%).

Multiple DPAs have been described previously in literature. Ishigaki reported two cases of multiple dorsal pancreatic arteries based on studies using computed tomography, in a sample of 45 patients (4%) <sup>[22],</sup> Sakaguchi two in 141 cases (1%) <sup>[25]</sup> and Iede discovered three in 34 instances (9%). <sup>[13]</sup> In our study, we identified in 4 cases (0.82%), where double DPA were visualised.

Previous studies have shown that the DPA, which can occasionally be as large as one-third of the SA, is regarded as the largest vessel leaving the SA. Its calibre is highly varied, ranging from 1 mm to about 1 cm, with a mean value of roughly 1-3 mm. <sup>[11]</sup> In our analysis, we found the average diameter of the DPA to be 2.05 mm, ranging from 1.0 - 4.8 mm. The uncinate process branch is an important branch supplying the head of pancreas. <sup>[35]</sup> Previous study by Tatsuoka T. et al <sup>[10]</sup> revealed that the branch's diameter ranged from 0.2 mm to roughly 2 mm. Regardless of where DPA originated, the average size was about 1 mm, and 80% of patients had calibres between 0.5 mm and 1.5 mm. <sup>[10]</sup> In our study, we could visualise this particular branch in 21.7% of cases, with mean diameter of 1.3 mm, ranging from 0.8 to 3.0 mm.

The greater pancreatic artery or pancreatica arteria magna, has been described in literature, to be seen in found in 73.1%–82% of cases based on angiographic studies <sup>[27, 36]</sup>. It has been predominantly been described as a branch of splenic artery. In our study, it was visualised in in 57.3% of the cases predominantly as a branch of the splenic artery except in 1 rare case it was seen arising from the left gastric artery, with mean diameter of 1.7 mm, and a range of 0.8 – 3.1 mm.

The cruciality of pre-operative visualisation of the DPA is primarily revealed during pancreaticoduodenectomies. Considered a technically challenging procedure, with high risk of post-operative complications including delayed gastric emptying, pancreatic fistulae, hemorrhage, chyle leaks, endocrine and exocrine pancreatic insufficiency, and surgical site infections <sup>[37]</sup>, multiple attempts are being made to improve outcome with respect to these in PD. Less than 10% of patients experience post-pancreatectomy bleeding, yet it is responsible for 11-38% of fatalities <sup>[38]</sup>. Early hemorrhage after a pancreatectomy is one that develops within 24 hours of surgery. It frequently results from technical GDA stump insufficiency. Late hemorrhage following a pancreatectomy happens up to 48 hours after the procedure. An ulcer, pancreatic leak, fistula, pseudoaneurysm, or anastomotic dehiscence are some of the potential

causes. <sup>[39]</sup> Pre-operative assessment and recognition of variations in various arteries of the region can help avoiding these catastrophic situations.

Type 1 diabetes mellitus is a crippling disease right from the childhood, with requirement of insulin usage throughout life. Isolating islets enables ectopic transplantation of cells that secrete insulin and glucagon within just a few millilitres of tissue volume, making islet transplantation another attractive alternative for treating these cases. <sup>[40]</sup> A uniform distribution of stem cells through the right branch to the pancreatic head and the left branch to the body and tail may result from the injection of stem cells into DPA. <sup>[24]</sup>

Pancreatic transplant is a curative option for type 1 diabetics, however, there has been an increase in the number of pancreatic transplants being presently done for Type 2 diabetes as well (7.4% of pancreatic transplants in 2016). A small number of pancreatic transplants are also carried out for malignancies necessitating pancreatectomy and chronic pancreatitis (see the section on islet cell transplantation). <sup>[41]</sup> The dorsal pancreatic artery is crucial to pancreatic transplantation. The blood flow to the tail of the pancreas may be hampered by unintentional damage to this artery, endangering the pancreatic graft. <sup>[7]</sup>

Endovascular coiling and embolization have emerged as a promising treatment option for spleen and splenic artery injuries following blunt trauma. Between the DPA and GPA is thought to be the optimal place for PSAE in order to prevent ischemic pancreatitis and the devascularization of the pancreas and to maintain the blood supply to the spleen. <sup>[42]</sup> Multiple studies have demonstrated that the proposed optimum location for embolization is between the DPA and GPA, with significantly increased splenic perfusion compared to the other two areas (before the DPA and after the GPA). Hence, variations of the DPA play an important role in decision making.

## CONCLUSION

- Variations in the anatomy of the DPA are important to be recognised prior to undertaking further surgical and endovascular intervention.
- MDCT evaluation in arterial phase has good detection rate for DPA and its terminal branches.
- The dorsal pancreatic artery is most commonly seen arising as a branch of the splenic artery, from its proximal third.
- The branch to the uncinate process is an important branch from surgical point of view.
- MDCT could demonstrate the intrapancreatic arcades only in 16.2% of the cases, with most common arcades being those including small and large branches.
- Greater pancreatic artery was seen predominantly as a branch originating from the splenic artery.

# LIMITATIONS OF THE STUDY

- Difficulty in detecting smaller branches on arterial phase CT, might contribute to lower visualisation of intrapancreatic arcade anatomy.
- Arcade anatomy was not correlated with anatomical specimens and DSA.
- Uncinate branch was visualised in relatively less number of cases.
## **REPRESENTATIVE CASES FROM THE STUDY**



Case 1: 32-year-old male, with history of right upper quadrant pain

Figure 6: (A) Coronal oblique MIP images of arterial phase of CECT abdomen shows DPA (yellow arrow) arising from SA (red arrow) and dividing into right (pink arrow) and left branch (blue arrow). (B) Depicts the right branch in the same patient (pink arrow) and the uncinate process branch (green arrow).

Case 2: 22-year-old male, with suspected appendicitis



Figure 7: Figure depicting greater pancreatic artery (GPA - yellow arrow) arising from the splenic artery (SA - red arrow)

Case 3: 56-year-old male, with pain abdomen.



Figure 8: (A) - Coronal MIP (Maximum Intensity Projection) image of arterial phase of CECT abdomen, showing DPA (yellow arrow), arising from SMA. (B) Axial MIP image of the same showing DPA (yellow arrow), arising from SMA (red arrow) and dividing into its right (blue arrow) and left branches (orange arrow)

Case 4: 45-year-old female, a known case of carcinoma cervix, on follow up imaging.



Figure 9: (A) Coronal MIP image of arterial phase of CECT abdomen shows DPA (Yellow Arrow) arising as a direct branch of the CA (red arrow). (B) VRT image (Volume Rendering Technique) image showing similar findings; Green Arrow: CA and Blue Arrow: DPA

## Case 5: 55-year-old male, with obstructive jaundice



Figure 10: (A) Coronal Oblique MIP image showing DPA (yellow arrow) arising as a branch of CHA (purple arrow), descending inferiorly and continuing as the left branch (transverse pancreatic artery) (green arrow). (B) VRT images revealing the similar findings. White arrow – CHA, Red Arrow - DPA

Case 6: 25-year-old male with a history of abdominal trauma,



Figure 11: (A) Axial MIP images of dual phase CT abdomen, showing DPA (yellow arrow), arising as a branch of a replaced right hepatic artery (blue arrow). (B) Sagittal MIP images: The replaced right hepatic artery was in turn arising from SMA, which was arising from a common celiacomesenteric trunk (green arrow)

Case 7: 32-year-old female, with suspected liver abscesses.



Figure 12: Axial MIP images of arterial phase of triple phase CT abdomen, revealing DPA (green arrow) arising from a common trunk (yellow arrow) with right gastroepiploic artery (blue arrow), which was seen arising from the SMA (red arrow) in this case.

# REPRESENTATIVE CASES OF PANCREATIC ARCADES SUBTYPES SEEN ON IMAGING



Figure 13: Oblique coronal MIP image showing Roman Ramos Type 1 pancreatic arcade with multiple small branches (yellow arrows) forming the arcade.



Figure 14: Oblique coronal MIP image showing Roman Ramos Type 2 pancreatic arcades with small (yellow arrow) as well as large arcades (red arrow).

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#### ANNEXURE I

#### PATIENT PROFORMA

Patient's Name:

Age:

Sex:

Hospital Registration Number: Father's/Guardian Name: Clinical Unit: Brief History:

Imaging results:

#### Table 1: DORSAL PANCREATIC ARTERY

PRESENT? (YES/NO)	
SINGLE/MULTIPLE (NUMBER)	
ORIGIN	
CALIBRE (in mm)	

#### Table 2: GREATER PANCREATIC ARTERY

PRESENT? (YES/NO)	
ORIGIN	
CALIBRE (in mm)	

## Table 3: TYPE OF ARCADE (Roman Ramos Classification)

### Table 4: UNCINATE PROCESS BRANCH OF DPA

PRESENT? (YES/NO)	
CALIBRE	

#### **ANNEXURE II**

#### CT REQUISITION/CONSENT FORM

#### ALL INDIA INSTITUTE OF MEDICAL SCIENCES, JODHPUR Department of Diagnostic and Interventional Radiology <u>CT SCAN REQUISITION FORM</u>

Patient name	Age/ Sex	Patient AIIMS ID	CT No
OPD/ IPD	Bed No	Ref. Physician	Date//
Pregnancy – (Yes/ No)	Date of LMP		
Any history of Allergy/ Asthma/ DM/ Any chemotherapy/ radiotherapy rece	' HTN/ Renal dises ived (Yes/ No):	ase/ cardiac disease/ surgery (Yes/ No):	

Serum Urea...... Serum Creatinine......

Clinical History and provisional diagnosis:

Previous scans (USG/ CT/ MRI) - (Yes/ No):

Area of interest (Please specify Non contrast / Contrast CT):

Clinician Signature:

Name and Designation:

#### For Radiology Department

Technician:	Appointment Date:	Duty Resident's Protocol:
	Time:	
Contrast used (ml):	Amount Paid:	For Technician:
	Bill No. :	
Remarks:		For Nursing Staff :

I/V Cannulation: Negative/ Positive oral contrast: Rectal Contrast:

**Informed consent for CT**: I hereby give my consent for injection of contrast/ Sedation/ Anaesthesia for CT Scan and if required admission in ICU. I have been explained the benefits, risks and likely complications involved in this procedure in a language which I understand

Contact no.....

Patient / Relative's Signature/ Thumb Impression:

## ANNEXURE III

### PATIENT INFORMATION SHEET

1. Title of study: Morphological analysis of arterial supply of pancreas and variations of dorsal pancreatic artery

2. Aim of study: To study the anatomy and variations of DPA and the arterial arcades supplying pancreatic parenchyma

3. Benefits from the study: The variations in the anatomy of dorsal pancreatic artery will help the surgeons and interventional radiologists to prevent and treat conditions such as post operative bleed and pseudoaneurysm formation. It will also contribute to lesser accidental trauma to the artery during pancreatic transplants therefore helping in prevention of transplant rejection and appropriate stem cell transplantation.

5.Risks to patients: There is no risk of death or any disability resulting directly due to imaging. No interventions or life-threatening procedure will be done.

6. Confidentiality: Your participation will be kept confidential. Your medical records will be treated with confidentiality and will be revealed only to doctors/scientists involved in this study. The results of this study may be published in a. scientific journal, but you will not be identified by name.

7. Provision of free treatment for research related injury: Not applicable

8. Compensation of subject's disability or death resulting from such injury, Not applicable.

9. Freedom of individual to participate and to withdraw from research at any time without penalty or loss of benefits to which the subject would otherwise be entitled. You have complete freedom to participate and to withdraw from research at any time without penalty or loss of benefits to which you would otherwise be entitled. Your participation in the study is optional and voluntary. The copy of the results of the investigations performed will be provided to you for your record. You can withdraw from the project at any time and this will not subsequent medical treatment or relationship with the treating physician. Any additional expenses for the project, other than your regular expenses, will not be charged from you.

10. For further information and to report any side effects/complications, Kindly contact:

Dr. Shaurya Sharma Junior Resident Department of Diagnostic and Interventional Radiology AIIMS, Jodhpur. Mob no: 9655530602

## ANNEXURE IV

# रोगी सूचना पत्र

 अध्ययन का शीर्षक: अग्र्याशय की धमनी की आपूर्ति का नैतिक विश्लेषण और पृष्ठीय अग्नाशय धमनी के संरचनात्मक रूपांतर

2. अध्ययन का उद्देश्य: डीपीए की शारीरिक रचना और रूपांतरों और अम्राशय के पक्षाघात की आपूर्ति करने वाली धमनी आर्कड्स का अध्ययन करना

3. अध्ययन से लाभ: पृष्ठीय अग्नाशय धमनी की शारीरिक रचना में बदलाव सर्जन और इंटरवेंशनल रेडियोलॉजिस्ट को पोस्ट ऑपरेटिव ब्लीड और स्यूडोनेयुरिस्म गठन जैसी स्थितियों को रोकने और इलाज में मदद करेगा। यह अग्नाशयी प्रत्यारोपण के दौरान धमनी को कम आकस्मिक आघात में भी योगदान देगा इसलिए प्रत्यारोपण अस्वीकृति और उपयुक्त स्टेम सेल प्रत्यारोपण को रोकने में मदद करता है।

5. रोगियों के लिए जोखिम: मृत्यु का कोई जोखिम नहीं है या किसी भी विकलांगता के कारण सीधे इमेजिंग के कारण होता है। कोई हस्तक्षेप या जीवन-धमकी की प्रक्रिया नहीं की जाएगी।

6. गोपनीयता: आपकी भागीदारी को गोपनीय रखा जाएगा। आपके मेडिकल रिकॉर्ड को गोपनीयता के साथ माना जाएगा और इस अध्ययन में शामिल डॉक्टरों / वैज्ञानिकों के लिए ही पता चलेगा। इस अध्ययन के परिणामों को एक में प्रकाशित किया जा सकता है। वैज्ञानिक पत्रिका, लेकिन आपको नाम से पहचाना नहीं जाएगा।

7. अनुसंधान संबंधी चोट के लिए मुफ्त उपचार का प्रावधान: लागू नहीं

8. इस तरह की चोट के परिणामस्वरूप विषय की विकलांगता या मृत्यु का मुआवजा, लागू नहीं।

9. भाग लेने या लाभ के नुकसान के बिना किसी भी समय अनुसंधान से पीछे हटने की स्वतंत्रता, जिसके लिए विषय अन्यथा हकदार होगा। आपको किसी भी समय दंड या लाभ के नुकसान के बिना भाग लेने और अनुसंधान से वापस लेने की पूरी स्वतंत्रता है, जिसके आप अन्यथा हकदार होंगे। अध्ययन में आपकी भागीदारी वैकल्पिक और स्वैच्छिक है। आपके द्वारा रिकॉर्ड की गई जांच के परिणामों की प्रति आपको प्रदान की जाएगी। आप किसी भी समय परियोजना से हट सकते हैं और इसके बाद चिकित्सा उपचार या उपचार चिकित्सक के साथ संबंध नहीं होगा। परियोजना के लिए कोई अतिरिक्त खर्च, आपके नियमित खर्चों के अलावा, आपसे कोई शुल्क नहीं लिया जाएगा।

10. अधिक जानकारी के लिए और किसी भी दुष्प्रभाव / जटिलताओं की रिपोर्ट करने के लिए, कृपया संपर्क करें:

डॉ। शौर्य शर्मा जूनियर निवासी नैदानिक और हस्तक्षेप रेडियोलॉजी विभाग एम्स, जोधपुर। मोब नं: 9655530602

#### **ANNEXURE V**

#### ETHICAL CLEARANCE CERTIFICATE



No. AIIMS/IEC/2021/2467

Date: 12/03/2021

#### ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number: AIIMS/IEC/2021/3302

Project title: "Morphological Analysis of Arterial Supply of Pancreas and Variations of Dorsal Pancreatic Artery"

Nature of Project:	Research Project Submitted for Expedited Review
Submitted as:	M.D. Dissertation
Student Name:	Dr. Shaurya Sharma
Guide:	Dr. Binit Sureka
Co-Guide:	Dr. Pushpinder S. Khera, Dr. Vaibhav Kumar Varshney, Dr. Subhash Chandry
	Soni & Dr. Taruna Yadav

Institutional Ethics Committee after thorough consideration accorded its approval on above project.

The investigator may therefore commence the research from the date of this certificate, using the reference number indicated above.

Please note that the AIIMS IEC must be informed immediately of:

- · Any material change in the conditions or undertakings mentioned in the document.
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research.

The Principal Investigator must report to the AIIMS IEC in the prescribed format, where applicable, bi-annually, and at the end of the project, in respect of ethical compliance.

AIIMS IEC retains the right to withdraw or amend this if:

- · Any unethical principle or practices are revealed or suspected
- Relevant information has been withheld or misrepresented

AIIMS IEC shall have an access to any information or data at any time during the course or after completion of the project.

Please Note that this approval will be rectified whenever it is possible to hold a meeting in person of the Institutional Ethics Committee. It is possible that the Pl may be asked to give more clarifications or the Institutional Ethics Committee may withhold the project. The Institutional Ethics Committee is adopting this procedure due to COVID-19 (Corona Virus) situation.

If the Institutional Ethics Committee does not get back to you, this means your project has been cleared by the IEC.

On behalf of Ethics Committee, I wish you success in your research.

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Department of Diagnostic & Interventional Radiology

AIIMS, JOUHPUR

Date 153 2021

Receipt No. ...

Dr. Prayten Sharma Member Secretary

Member secretary Institutional Ethics Committee AIIMS, Jodhpur

Basni Phase-2, Jodhpur, Rajasthan-342005; Website: www.aiimsjodhpur.edu.in; Phone: 0291-2740741 Extn. 3109 E-mail : ethicscommittee@aiimsjodhpur.edu.in; ethicscommitteeaiimsjdh@gmail.com

## ANNEXURE VI

#### PARTICIPANT INFORMED CONSENT FORM

Participant identification number for this study: \_\_\_\_\_\_ Title of project: Morphological Analysis of Arterial Supply of Pancreas and Variations of Dorsal Pancreatic Artery. Name of Principal Investigator: Dr. Shaurya Sharma

Contact no 9655530602

The Contents of the information sheet dated ...... that was provided have been read carefully by me / explained in detail to me, in a language that I comprehend, and I have fully understood the contents. I confirm that I have had the opportunity to ask questions. The nature and purpose of the study and its potential risks / benefits and expected duration of the study, and other relevant details of the study have been explained to me in detail. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal right being affected.

I understand that the information collected about me from my participation in this research and sections of any of my medical notes may be looked at by responsible individuals from AIIMS. I give permission for these individuals to have access to my records.

I agree to take part in the above study.	
Date:	
(Signatures / Left Thumb Impression)	
Place:	
Name of the Participant:	
Son / Daughter / Spouse	of:
Complete postal address:	
This is to certify that the above consent has b	been obtained in my presence
Signature of the Principal Investigator:	Place: Date:
1) Witness – 1	2) Witness $-2$
Signature	Signature
Name:	Name:
Address:	Address:

# सहभागी सूचित सहमति फॉर्म

इस परीक्षण के लिए प्रतिभागी पहचान संख्याः \_\_\_\_ अग्र्याशय की धमनी आपूर्ति और पृष्ठीय अग्नाशय धमनी की विविधताओं का रूपात्मक विश्ले षण प्रधान अन्वेषक का नामः डॉ शौर्य शर्मा मोब नं 9655530602 सूचना शीट की सामग्री ...... प्रदान की गई थी, मेरे द्वारा विस्तृत रूप से पढ़ा गया / विस्तार से मेरे लिए, उस भाषा में, जिसे मैं समझता हूं, और मैंने पूरी तरह से सामग्री को समझा है। मैं पुष्टि करता हूं कि मुझे प्रश्न पूछने का अवसर मिला है। अध्ययन की प्रकृति और उद्देश्य और इसके संभावित जोखिम / लाभ और अध्ययन की अपेक्षित अवधि और अध्ययन के अन्य प्रासंगिक विवरण मुझे विस्तार से समझाए गए हैं। मैं समझता हूं कि मेरी भागीदारी स्वैच्छिक है और मैं किसी भी समय बिना किसी कारण के बिना किसी भी समय वापस लेने के लिए स्वतंत्र हूं. मेरी चिकित्सा देखभाल या कानूनी अधिकार के बिना प्रभावित हो रहा है। मैं समझता हं कि इस शोध में मेरी भागीदारी से मेरे बारे में एकत्रित की गई जानकारी और किसी भी मेडिकल नोट के कुछ हिस्सों को एम्स के जिम्मेदार व्यक्तियों द्वारा देखा जा सकता है। मैं इन लोगों के लिए मेरे रिकॉर्डों तक पहुंच की अनुमति देता हं मैं उपरोक्त अध्ययन में भाग लेने के लिए सहमत हं मैं उपरोक्त अध्ययन में भाग लेने के लिए सहमत हूँ। तारीख: -----(हस्ताक्षर / बाएं अंगूठे छाप) -----जगह: \_\_\_\_ प्रतिभागी का नाम: \_\_\_\_\_ बेटा / बेटी / पति काः \_\_\_\_\_ पूरा डाक पताः \_\_\_\_\_\_ यह प्रमाणित करना है कि उपरोक्त सहमति मेरी उपस्थिति में प्राप्त की गई है -------प्रधान अन्वेषक के हस्ताक्षरः स्थानः तिथिः 1) साक्षी - 1 2) साक्षी - 2 नाम नाम हस्ताक्षर -----हस्ताक्षर -----पता पता

#### **ANNEXURE VII**

#### MASTERCHART

Calibre?								1.3																							1.3		1.1							
GPA - Calibre Type Of Arcade Uncinate Process Branch of DPA	1.8 0 No	1.5 0 No	1.7 1	1.1 0 No	1.4 0	1.7 1 No	1.3 0	2 Yes	0 No	1.1 1	0 No	0	1.2 0 No	0 No	0	0	0	1.4 0 No	1.8 0	1.9 0 No	0 No	2 0	1.3 0 No	1.7 0 No	1.8 0	0 No	0	1.9 No	0	2.6 0	0 Yes	1.2 2	0 Yes	0 No	1.2 1 No	1 0	0 No	1.9 0	2.2 1 No	2.5 0
DPA - Calibre GPA - Present? GPA - Origin?	2 Yes SA	1.7 Yes SA	Yes SA	1.3 Yes SA	Yes SA	1.2 Yes SA	Yes SA	1.6 No	1.8 No	Yes SA	1.4 No	No	1.7 Yes SA	1.8 No	No	No	No	1.5 Yes SA	Yes SA	1.7 Yes SA	2.4 No	Yes SA	1.7 Yes SA	2 Yes SA	Yes SA	1.8 No	No	2.2 Yes SA	No	Yes SA	2 No	yes SA	2.7 No	2.4 No	2.1 Yes SA	Yes SA	2.2 No	Yes SA	2.9 Yes SA	Yes SA
DPA - Number? DPA- Origin	1 CA	1 SA		1 SA		1 CA		1 CA	1 SA		1 SA		1 SA	1 SA				1 SA		1 SMA	1 SA		1 SA	1 SA		1 CA		1 CA			1 SA		1 SA	1 SMA	1 CHA		1 SMA (J)		1 SMA	
DPA - Present?	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	No	No	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No
Age Sex	51 M	51 M	58 M	37 F	41 M	25 M	51 M	63 M	45 M	40 F	46 F	78 F	59 M	52 F	47 F	48 F	55 F	53 F	59 M	65 F	55 M	72 M	49 M	42 F	55 M	40 M	46 M	75 M	31 M	50 M	24 M	46 F	48 F	35 M	56 F	65 M	55 F	53 F	25 M	68 F
S. No. AIIMS ID	1 2020/10/001382	2 2021/07/004833	3 2021/03/007444	4 2021/04/009850	5 2018/05/014530	6 2021/04/003853	7 2020/10/001930	8 2021/04/007741	9 2020/12/007617	10 2021/07/007454	11 2021/07/009581	12 2021/07/003009	13 2013/10/004841	14 2021/05/006637	15 2021/07/012266	16 2018/07/018890	17 2021/06/003770	18 2021/07/007698	19 2017/02/004820	20 2021/01/018713	21 2021/04/004689	22 2021/06/006856	23 2021/06/002590	24 2021/01/021443	25 2021/03/024442	26 2021/03/024412	27 2020/06/007101	28 2021/04/010409	29 2021/07/017041	30 2021/02/012606	31 2021/08/001913	32 2021/07/014310	33 2021/06/009739	34 2021/07/000114	35 2019/12/006410	36 2021/08/006252	37 2021/08/007011	38 2021/06/014734	39 2021/07/009119	40 2021/02/008744

S. No. AIIMS ID	Age	Sex	DPA - Present?	DPA - Number?	DPA- Origin	DPA - Calibre	GPA - Present?	GPA - Origin?	GPA - Calibre T	Type Of Arcade Uncinate Process Branch of DPA	Calibre?
41 2021/02/007534		60 M	Yes	-	5A	3.2	Yes	SA	2.8	3 No	
42 2020/09/005627		51 M	Yes	1	SMA	2.3	No			0 No	
43 2021/08/014477		66 M	No				Yes	SA	2.5	0	
44 2021/06/002913		40 M	No				Yes	SA	1.9	0	
45 2021/08/016421		63 M	Yes	1	5A	2.3	Yes	SA	1.9	0 No	
46 2021/09/000842		50 M	yes	1 (	A	1.9	Yes	SA	1.5	0 No	
47 2020/12/004897		19 F	No				No			0	
48 2021/11/003016		49 F	Yes	1	5A	1.8	No			0 No	
49 2021/11/004379		44 M	Yes	1	5A	£	No			0 Yes	1.1
50 2019/09/017250		34 F	Yes	1	5A	2.5	Yes	SA	1.8	0 No	
51 2021/09/016323		39 F	Yes	1	SA	1.4	Yes	SA	1.4	0 Yes	1.2
52 2021/09/014227		47 F	Yes	1	5A	2.5	No			0 No	
53 2021/10/003970		52 M	Yes	1	RA BA	1.5	Yes	SA	1.2	0 No	
54 2021/03/01033		18 F	Yes	1	5A	1.2	Yes	SA	1.6	2 No	
55 2021/11/013860		30 F	No				No			0	
56 2021/11/011228		52 F	yes	1 (	A	£	No			2 No	
57 2021/11/015048		28 F	Yes	1	5A	1.5	yes	SA	1.1	2 No	
58 2021/11/004807		27 F	Yes	1	SMA	1.7	No			0 No	
59 2021/10/017903		72 F	No				Yes	SA	1.7	2	
60 2021/11/016116		50 F	Yes	1	ŝA	ĉ	Yes	SA	2	0 No	
61 2021/11/011548		55 F	Yes	1	SMA	1.6	Yes	SA	1.7	0 No	
62 2021/07/014091		27 F	No				yes	SA	1.4	0	
63 2021/11/013743		36 F	Yes	1	SA	1.5	Yes	SA	1.8	0 Yes	1.1
64 2021/11/015304		77 M	No				yes	SA	1.5	0	
65 2021/07/003325		60 M	Yes	1	SMA	1.3	No			0 Yes	1
66 2021/12/000382		33 M	yes	1	SMA	1.7	Yes	SA	1.1	0 No	
67 2021/02/002694		58 M	No				Yes	SA	2.2	0	
68 2021/10/018578		65 M	Yes	1	SMA	1.9	No			0 No	
69 2022/02/010055		54 M	Yes	1	5A	£	No			0 Yes	0.9
70 2021/12/008458		53 M	Yes	Т	5A	1.4	No			0 No	
71 2021/11/013116		46 M	No				No			0	
72 2019/08/002505		71 M	Yes	1	5A	1.9	No			0 No	
73 2021/12/009880		75 M	Yes	1	5A	1.5	No			0 No	
74 2021/11/010536		60 M	Yes	1	5A	2	No			0 No	
75 2021/12/013547		30 F	Yes	1	ŝA	2.1	Yes	SA	1.6	3 No	
76 2021/12/015509		39 F	Yes	2 (	CHA, SA	1.6	Yes	SA	1.3	0 Yes	0.9
77 2021/12/010739		53 M	Yes	1	5A	1.5	No			0 No	
78 2014/10/002674		52 M	No				yes	SA	1.7	2 No	
79 2021/12/012707		40 F	N				Yes	SA	1	0	
80 2021/03/000114		21 F	Yes	1	SMA	3.3	Yes	SA	2.4	0 No	

alibre?																						0.9																	
PA - Calibre Type Of Arcade Uncinate Process Branch of DPA C	1.4 0 No	0	1.3 0 No	1.7 1	0 No	0 No	1.4 0 No	1.8 0 No	1.6 0	2.2 0 No	1.5 0 No	1 0	0 No	1.3 1	1 0	0 No	1.4 0 No	1.8 0 No	1.4 0 No	0	0 No	1.3 0 Yes	1.5 0	1.2 0 No	1.6 0 No	1.7 0 No	2.1 0	1.8 1 No	1.8 0 No	1.4 0 No	0 No	0	0 No	1.6 0	0	0 No	0	0 No	2.4 3 No
DPA - Calibre GPA - Present? GPA - Origin? G	1.1 Yes SA	No	1.4 Yes SA	Yes SA	1.4 No	3.8 No	2.1 Yes SA	2.2 Yes SA	Yes SA	2.2 Yes SA	1.2 Yes SA	1.8 Yes SA	2 No	Yes SA	Yes SA	3.8 No	2.1 Yes SA	2.3 Yes SA	2.3 Yes SA	No	3.1 No	2.2 Yes SA	Yes SA	1.8 Yes SA	2 Yes SA	1.9 Yes SA	Yes SA	2.2 Yes SA	1.5 Yes SA	2.3 Yes SA	1.7 No	No	1.8 No	Yes SA	No	2.1 No	No	1.6 No	2.3 Yes SA
DPA - Number? DPA- Origin	1 SA		1 SA		1 SMA	1 SA	1 CA	1 SA		1 SA	1 SA	2 SA, SMA (r)	1 SA			1 SA	1 CA	1 SMA	1 CA		1 SA	1 SA		1 SMA	1 SA	1 SA		1 SMA	1 SA	1 SA	1 CA		1 SA			1 SA		1 CA	1 SA
Age Sex DPA - Present?	51 F Yes	63 M No	25 M Yes	72 M No	80 F Yes	66 M Yes	50 F Yes	72 M Yes	35 M No	61 M Yes	58 M Yes	54 M Yes	15 M Yes	52 M No	18 M No	24 M Yes	27 M Yes	1 M Yes	44 M Yes	35 F No	19 M Yes	56 M Yes	26 M No	47 M Yes	36 F Yes	65 F Yes	56 F No	70 M Yes	11 M Yes	75 M Yes	44 M Yes	42 M No	19 M Yes	28 F No	35 M No	67 M Yes	59 M No	52 M yes	38 M Yes
5. No. AIIMS ID	81 2021/11/008190	82 2021/12/012070	83 2021/12/018161	84 2015/04/002350	85 2021/12/017943	86 2021/12/018078	87 2021/12/012973	88 2021/12/019125	90 2022/01/021226	91 2018/03/008134	92 2021/06/011140	93 2022/01/021788	94 2022/01/023195	95 2022/01/022056	96 2022/01/021486	97 2022/01/023647	98 2022/01/023317	99 2021/12/000858	100 2022/01/021642	101 2021/12/009283	102 2022/01/026083	103 2021/12/002366	104 2022/01/026244	105 2021/12/002647	106 2021/10/002980	107 2018/12/005492	108 2022/01/025842	109 2019/04/012353	110 2022/01/027270	111 2022/01/027624	112 2017/11/014615	113 2020/08/008818	114 2022/01/027963	115 2021/11/005622	116 2020/03/012442	117 2020/01/019285	118 2021/10/009406	119 2021/03/000358	120 2017/11/010609

Calibre?						1.5																		0.8																
GPA - Calibre Type Of Arcade Uncinate Process Branch of DPA	0 No	2 No	0 No	0 No	1.9 3 No	1.7 0 Yes	2.1 2 No	1.9 0	2 No	1.3 0 No	0 No	2.5 0 No	1.8 0	0 No	1.7 0 No	0	1.8 0	2.2 0 No	1.5 0	0 No	2.9 0 No	0 No	1.8 0	0 Yes	2.7 0 No	2.2 0 No	0 No	1.4 2 No	0	1.7 0 No	1.8 0 No	1.9 2 No	1.4 0	2.6 0 No	1.2 0	2.2 0 No	1.2 0 No	0	1.2 0	0 No
0PA - Calibre GPA - Present? GPA - Origin?	2.1 No	2.4 No	2.2 No	2.2 No	3.3 Yes SA	2.6 Yes SA	3.1 Yes SA	Yes SA	1.9 No	4 Yes SA	2.5 No	2.2 Yes SA	yes SA	1.6 No	1.8 Yes SA	No	Yes SA	2.2 Yes SA	Yes SA	1.8 No	2.5 Yes SA	2 No	Yes SA	2 No	3 Yes SA	2 yes SA	1.8 No	2.5 Yes SA	No	2.4 Yes SA	2.1 Yes SA	2.2 Yes SA	Yes SA	1.7 Yes SA	Yes SA	1.8 Yes SA	1.4 Yes SA	No	Yes SA	1.9 no
DPA - Number? DPA- Origin E	1 CHA	1 SA	1 SA	1 CHA	1 SMA	1 CHA	1 SA		1 (R) GEPA	1 CHA	1 SMA	1 CA		1 SA	1 SA			1 SA		1 SA	1 SMA	1 SA		1 SA	1 SMA	1 SA	1 SA	1 CHA		1 SMA	1 SA	1 SMA		1 SA		1 CHA	1 SMA			1 SA
DPA - Present?	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	N	N	Yes						
Age Sex	64 M	54 M	20 M	45 M	37 M	55 M	47 M	44 M	29 M	18 M	28 M	41 F	45 F	74 M	70 M	40 M	46 M	57 M	56 M	32 M	28 F	74 M	56 F	54 M	36 M	29 M	81 F	50 F	50 M	28 M	53 M	37 F	65 M	54 M	64 M	57 M	58 M	50 M	70 M	22 F
S. No. AIIMS ID	121 2022/01/022901	122 2021/10/007282	123 2022/01/030125	124 2022/01/031029	125 2020/07/005530	126 2022/01/032059	127 2022/01/032700	128 2022/01/032135	129 2022/01/032537	130 2021/12/010130	131 2021/12/003927	132 2021/10/013727	133 2022/01/031989	134 2016/08/001690	135 2022/01/032925	136 2022/01/033670	137 2022/01/034457	138 2022/01/034661	139 2021/12/004172	140 2021/11/007778	141 2022/01/026240	142 2022/01/028340	143 2022/01/036095	144 2022/01/034012	145 2022/01/035256	146 2021/12/005365	147 2022/01/035585	148 2021/07/015497	149 2022/02/002922	150 2021/12/010078	151 2022/02/004703	152 2021/12/010021	153 2022/01/024211	154 2022/01/029874	155 2020/12/001426	156 2022/03/002305	157 2022/03/004061	158 2022/03/002423	159 2021/11/008371	160 2022/03/005926

	N					dlbrc:
40 M	Yes	1 SA	1.6 Yes SA	1.8	0 No	
66 M	No		No		0	
50 M	Yes	1 CHA	2.1 Yes SA	1.8	0 No	
30 M	No		No		0	
34 F	Yes	1 SA	2.2 Yes SA	1.9	0 No	
64 M	Yes	1 SMA	2.3 Yes SA	1.9	0 No	
32 M	Yes	1 GDA	2.9 Yes SA	1.9	2 No	
45 M	Yes	1 SA	2.2 Yes SA	1.6	0 No	
50 M	Yes	1 CHA	2.2 Yes SA	1.8	0 Yes	1
64 M	No		No		0	
60 M	No		Yes SA	1.9	0	
85 F	Yes	1 CHA	2.8 Yes SA	1.4	0 Yes	1.(
49 F	Yes	1 AA	2.8 No		0 Yes	1.
43 M	No		No		0	
54 M	Yes	1 SA	1.4 No		0 No	
52 M	Yes	1 SMA	2.3 Yes SA	2.2	0 No	
49 M	Yes	1 CHA	2.2 Yes SA	1.6	0 No	
70 M	Yes	1 SMA	2.8 No		0 No	
72 F	Yes	1 SA	1.4 No		0 No	
60 M	Yes	1 SA	2.2 Yes SA	1.7	0 No	
55 F	Yes	1 SA	1.8 Yes SA	1.8	0 No	
21 F	Yes	1 SMA	2.5 No		0 Yes	0.9
70 M	Yes	1 SMA	1.2 Yes SA	2.8	2 No	
34 M	No		No		0	
69 F	No		Yes SA	1.8	0	
55 F	Yes	1 SA	1.8 No		0 No	
34 F	Yes	1 SA	1.9 No		0 No	
65 F	Yes	1 CHA	2.8 No		0 No	
20 M	Yes	1 SMA	2.1 No		0 No	
54 F	Yes	1 SMA	2 Yes SA	2.2	0 No	
73 M	No		Yes SA	1.8	0	
66 M	No		yes SA	2.2	0	
33 F	Yes	1 SA	1.2 Yes SA	1	0 No	
31 M	Yes	1 SA	1.9 Yes SA	1.7	0 Yes	1.
48 M	No		No		0	
45 F	No		Yes SA	1.5	0	
47 M	Yes	1 SA	1.8 No		2 Yes	1.
28 M	Yes	1 SA	1.4 No		0 No	
54 M	Yes	1 SA	1.8 Yes SA	1.9	0 No	
20 M	Yes	1 SMA	3.2 No		2 No	

25 F		AC	1.7 Yes		2 No	
	Yes	1 SA	2 Yes SA	 2.4	3 Yes	1.8
40 M	Yes	1 SA	2.5 No		0 No	
60 M	Yes	1 IPDA	1.9 Yes SA	1.8	0 No	
54 F	Yes	1 SA	2 No		0 No	
53 F	Yes	1 Replaced RHA	3.3 No		0 No	
45 M	Yes	1 SA	2.1 No		0 No	
47 F	Yes	1 IPDA	2.2 Yes SA	1.5	0 No	
77 M	No		Yes SA	2.2	0	
63 F	Yes	1 CHA	2.2 Yes SA	1.8	0 No	
64 F	Yes	1 SMA	2.8 Yes SA	1.4	0 No	
53 M	Yes	1 SA	1.9 No		0 No	
16 F	No		No		0	
35 M	Yes	1 SA	2.5 No		0 No	
60 M	Yes	1 SMA	1.9 Yes SA	1.8	0 No	
60 M	Yes	1 SA	3 No		0 No	
60 M	No		Yes SA	1.7	0	
65 M	Yes	1 SA	3.4 No		0 Yes	1
26 M	Yes	1 SA	2.3 Yes SA	1.7	3 No	
43 M	No		No		0	
44 F	Yes	1 SMA	2.1 No		0 No	
27 M	Yes	1 CHA	2.1 Yes SA	0.9	0 No	
60 M	No		Yes SA	1	0	
51 F	Yes	1 SA	1.7 Yes SA	1	0 No	
49 F	Yes	1 SA	1.6 Yes SA	1.8	0 No	
53 M	No		Yes SA	1.4	0	
40 F	Yes	1 SA	1.6 No		0 No	
42 M	Yes	1 SMA	1.5 Yes SA	1.2	2 No	
53 M	No		Yes SA	1.8	0	
70 M	Yes	1 CHA	2.4 Yes SA	1.7	0 No	
55 M	Yes	1 SA	2.3 No		0 No	
72 F	No		Yes	1.1	0	
56 F	Yes	1 SMA	1.8 Yes SA	1.5	2 No	
45 M	Yes	1 SMA	2.5 Yes SA	1.7	3 Yes	1.3
40 M	Yes	1 SMA	1.4 Yes SA	1.9	1 No	
54 M	Yes	1 SA	1.2 No		0 No	
65 F	Yes	1 SA	1.3 No		0 No	
54 M	Yes	1 SMA	1.9 Yes SA	1.2	0 No	
21 M	Yes	1 SA	2 Yes SA	1.5	2 Yes	-
40 M	Yes	1 SMA	1.6 Yes SA	1.8	0 Yes	~

Age Sex 20 M		DPA - Present? Yes	DPA - Number? DPA- Origin 1 CHA	DPA - Calibre GPA - Present? 1.5 Yes	GPA - Origin? SA	GPA - Calibre T 1.6	ype Of Arcade Uncinate Process Branch of DPA 0 Yes	Calibre? 0.9
38 M No	No			No			0	
55 M Yes 1 CHA	Yes 1 CHA	1 CHA		2.4 Yes	SA	0.8	0 No	
56 M No	No			Yes	SA	2	0	
36 F Yes 1 SA	Yes 1 SA	1 SA		2 Yes	SA	1.5	2 No	
26 M No	No			No			0	
63 M No	No			yes	SA	1.4	0	
55 F No	No			No			0	
67 M Yes 1 SA	Yes 1 SA	1 SA		2.1 No			2 Yes	1.4
71 M No	No			Yes	SA	1.5	0	
36 M No	No			Yes	SA	2.3	1	
26 M Yes 1 SA	Yes 1 SA	1 SA		1.8 No			0 No	
43 F Yes 1 SA	Yes 1 SA	1 SA		2.4 Yes	SA	2.2	2 Yes	1.4
52 M Yes 1 SA	Yes 1 SA	1 SA		1.8 No			0 Yes	1.1
35 F Yes 1 CHA	Yes 1 CHA	1 CHA		2.3 Yes	SA	1.1	3 Yes	1.2
41 F Yes 1 CHA	Yes 1 CHA	1 CHA		2.2 No			0 Yes	0.8
75 M Yes 1 CA	Yes 1 CA	1 CA		2.2 No			0 No	
80 M	No			Yes	SA	1.4	m	
46 F No	No			No			0	
34 M Yes 1 SMA	Yes 1 SMA	1 SMA		3.4 No			2 Yes	£
28 M Yes 1 SA	Yes 1 SA	1 SA		1.2 Yes	SA	1.1	0 Yes	1.1
22 M No	No			N			0	
56 F Yes 1 SA	Yes 1 SA	1 SA		1.5 No			0 No	
56 M Yes 1 CA	Yes 1 CA	1 CA		2.2 Yes	SA	1	0 No	
47 F No	No			Yes	SA	1.3	0	
9 M	No			Yes	SA	1	0	
62 M Yes 1 SMA	Yes 1 SMA	1 SMA		2 Yes	SA	1.1	0 No	
42 M Yes 1 CHA	Yes 1 CHA	1 CHA		1.5 No			0 No	
50 M Yes 1 SA	Yes 1 SA	1 SA		1.9 Yes	SA	2.2	0 No	
40 M Yes 1 SA	Yes 1 SA	1 SA		2.6 No			0 No	
51 F Yes 1 SA	Yes 1 SA	1 SA		2 Yes	SA	2	0 No	
42 M Yes 1 SMA	Yes 1 SMA	1 SMA		3 No			0 No	
40 F No	No			Yes	SA	1.5	2	
17 F Yes 1 SA	Yes 1 SA	1 SA		2.2 Yes	SA	1.9	2 No	
43 F No	No			Yes	SA	1.8	0	
54 M Yes 1 SMA	Yes 1 SMA	1 SMA		1.9 Yes	SA	1.4	3 No	
25 F No	No			Yes	SA	1.5	0	
60 F Yes 1 CHA	Yes 1 CHA	1 CHA		1.7 No			0 Yes	1.1
69 M Yes 1 SA	Yes 1 SA	1 SA		2.2 No			0 No	
48 F Yes 1 SMA	Yes 1 SMA	1 SMA		1.7 Yes	SA	2.1	3 No	

S. No. AIIMS ID	Age	Sex	DPA - Present?	DPA - Number? DPA- Origin	DPA - Calibre GPA - Present?	GPA - Origin?	GPA - Calibre	Type Of Arcade Uncinate Process Branch of DPA (	Calibre?
321 2022/06/004547		70 M	Yes	1 SA	1.8 Yes	SA	2.8	2 No	
322 2022/04/002389		29 M	Yes	1 SA	1.8 Yes	SA	1.7	0 No	
323 2022/06/003958		65 M	Yes	1 SMA	2 Yes	SA	2	0 No	
324 2022/06/005684		59 M	No		Yes	SA	2	0	
325 2022/06/004236		62 M	Yes	1 SA	3.4 Yes	SA	1.2	0 Yes	1.4
326 2022/06/003335		70 F	Yes	1 SA	1.8 No			0 No	
327 2016/07/006548		68 M	No		No			0	
328 2022/06/004537		58 M	No		Yes	SA	1.4	0	
329 2021/07/015561		72 F	Yes	1 SA	1.3 No			0 Yes	0.9
330 2022/06/005443		56 M	No		Yes	SA	2	0	
331 2022/06/006468		66 M	Yes	1 SA	1.4 No			0 No	
332 2022/06/007792		32 F	Yes	1 Replaced RHA	1.6 Yes	SA	1.5	0 Yes	1.1
333 2022/06/008574		45 M	Yes	1 SA	1.5 Yes	SA	1.2	2 No	
334 2022/01/035176		55 M	No		No			0	
335 2022/03/010455		65 M	Yes	1 SA	2.3 Yes	SA	2.1	0 Yes	0.8
336 2022/06/009077		42 M	No		Yes	SA	1.5	0	
337 2022/06/008989		17 M	No		Yes	SA	1.3	0	
338 2022/04/003766		28 M	Yes	1 CA	2.2 No			0 Yes	1
339 2022/06/008328		53 M	Yes	1 SA	1.9 No			0 No	
340 2013/10/004257		54 M	Yes	1 SA	2 Yes	SA	1.5	0 No	
341 2022/05/012075		74 M	Yes	1 SA	2.5 Yes	SA	1.9	0 Yes	1.3
342 2022/05/020819		24 F	Yes	1 SA	2.2 Yes	SA	1.6	0 No	
343 2022/04/002097		45 F	No		Yes	SA	1.6	0	
344 2022/05/010555		35 F	No		Yes	SA	2.7	0	
345 2015/12/002992		57 M	Yes	1 CHA	2.5 No			0 No	
346 2022/02/010466		70 M	Yes	1 SA	2.2 Yes	SA	2.6	0 Yes	1
347 2022/04/001065		53 F	No		Yes	SA	1.5	0	
348 2022/06/007175		91 M	Yes	1 SMA	2.2 No			0 Yes	1.7
349 2021/09/012729		41 F	No		Yes	SA	1.5	0	
350 2022/06/007054		78 M	Yes	1 SA	2.8 No			0 No	
351 2022/06/006592		60 F	No		No			0	
352 2022/06/003458		75 M	Yes	1 SA	2.2 Yes	SA	1.7	2 No	
353 2022/06/011485		56 F	Yes	1 SA	1.5 Yes	SA	2.8	3 No	
354 2022/06/003799		68 M	No		Yes	SA	1.2	0	
355 2022/06/007924		27 M	Yes	1 SA	1.9 Yes	SA	1.4	3 No	
356 2022/03/016536		69 M	No		Yes	SA	1.5	0	
357 2022/06/009723		62 M	Yes	1 SA	1.7 No			0 Yes	1.1
358 2022/03/016992		49 F	No		Yes	SA	1.8	0	
359 2022/05/008138		26 F	Yes	1 CHA	2.2 Yes	SA	1.8	0 Yes	1.5
360 2021/09/019360		51 M	Yes	1 SA	1.8 No			0 Yes	1.1

										1.3					1.1		1.3													1.7									1.2	
Calibre?																																								
Type Of Arcade Uncinate Process Branch of DPA	3 No	0 No	2 No	0 No	0	0 No	2 No	0 No	0 No	2 Yes	0	0	3 No	0	0 Yes	0 No	2 Yes	0	0	0	0 No	0	1 No	0 No	0 No	0	0	2 No	0 No	0 Yes	0	0	0 No	3 No	0 No	0	1 No	2 No	0 yes	0 No
GPA - Calibre	1.5		2.1		2.2	1.7			2.2	2.2			1.4	1.5			1.8				2.2	1.9			1.4		1.7	2		1.6				1.9				1.8	2.3	1.7
GPA - Origin?	SA		SA		SA	SA			SA	SA			SA	SA			SA				SA	SA			SA		SA	SA		SA				SA				SA	Sa	SA
DPA - Calibre GPA - Present?	2.1 Yes	1.5 No	3.1 Yes	2.2 No	Yes	1.7 Yes	1.5 No	1.8 No	1.7 Yes	1.7 Yes	No	No	1.9 Yes	Yes	1.7 No	1.5 No	2.5 Yes	No	No	No	1.1 Yes	Yes	1.9 No	2 No	2.2 Yes	No	Yes	1.7 Yes	2.2 No	2.5 Yes	No	No	2.5 No	2.4 Yes	1.9 No	No	1.3 No	2.2 Yes	2.7 yes	1.3 Yes
DPA - Number? DPA- Origin	1 SA	1 SA	1 CA	1 SA		1 CHA	1 SMA	1 SA	1 CA	2 SA, SMA			1 SA		1 SA	1 SA	1 SMA				1 SMA		1 SMA	1 SA	1 SA			1 SA	1 CHA	1 SA			1 SA	1 SA	1 SMA		1 IPDA	1 SA	1 SA	1 SA
DPA - Present?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Sex	42 F	26 F	37 M	54 F	41 M	62 M	19 M	16 F	28 F	32 F	50 F	85 M	73 M	55 M	46 F	57 M	21 M	36 M	71 M	80 F	60 M	48 M	30 M	19 M	48 F	61 M	65 M	46 F	23 M	63 M	77 M	60 M	66 F	58 M	21 M	57 M	84 F	77 M	30 M	55 M
Age																																								
S. No. AIIMS ID	361 2022/05/016330	362 2022/06/009139	363 2021/10/008908	364 2022/06/011772	365 2018/03/013721	366 2022/05/018097	367 2022/06/012685	368 2022/04/003877	369 2022/06/001079	370 2022/05/014694	371 2022/06/014030	372 2022/06/009494	373 2022/06/010268	374 2022/06/013094	375 2022/06/010338	376 2022/04/015030	377 2022/06/015492	378 2022/06/015248	379 2022/06/009865	380 2022/05/018283	381 2022/01/034603	382 2022/06/015622	383 2022/06/013849	384 2021/04/002208	385 2022/06/011998	386 2022/03/003012	387 2022/06/017272	388 2022/06/014116	389 2022/06/016612	390 2022/06/016386	391 2021/11/001170	392 2022/06/015970	393 2022/06/015395	394 2022/06/012640	395 2022/06/018048	396 2022/04/010353	397 2022/06/014260	398 2022/06/016093	399 2022/06/017584	400 2022/06/018792

Age	Sex 55 M	DPA - Present? Yes	DPA - Number? DPA-	- Origin	DPA - Calibre GPA - Present 3 Yes	t? GPA - Origin? SA	GPA - Calibre T 2.4	Type Of Arcade Uncinate Process Branch of DPA 1 Yes	Calibre?
	80 M	Yes	1 SA		1.5 No		i	0 No	
	59 M	N			Yes	SA	1.7	0	
	74 M	Yes	1 SMA		1.9 No	No		1 No	
	33 M	Yes	1 SA		1.6 Yes	SA	1.5	2 Yes	0.9
	51 M	Yes	1 SA		2.2 Yes	SA	2.7	0 No	
	63 M	Yes	1 SA		2.1 Yes	SA	1.9	0 No	
	45 F	Yes	1 SA		2.5 No			0 Yes	1.1
	45 M	Yes	1 SA		1.9 Yes	SA	1.7	2 Yes	1.2
	75 M	No			Yes	SA	1.2	0	
	45 M	Yes	1 SA		1.5 No			0 No	
	25 M	Yes	1 Replá	aced RHA	2.8 No			0 No	
	47 M	Yes	1 SA		1.4 Yes	SA	1.9	2 Yes	1
	62 M	No			Yes	SA	1.5	0	
	76 M	Yes	1 SA		2.7 Yes	SA	1.6	0 No	
	45 M	No			No			1	
	29 F	Yes	1 SA		1.9 Yes	SA	2.2	0 Yes	1
	23 M	Yes	1 SMA		1.7 Yes	SA	1.3	3 Yes	0.8
	50 M	Yes	1 SMA		2 No			0 No	
	51 M	No			Yes	SA	3.1	0	
	62 M	Yes	1 SA		1.8 Yes	SA	2.2	0 No	
	56 M	Yes	1 SA		2.4 No			0 No	
	66 F	No			No			0	
	59 M	Yes	1 SA		2.2 Yes	SA	1.2	3 No	
	18 F	Yes	1 SA		1.5 No			0 No	
	42 M	Yes	1 SMA		1.5 Yes	SA	1.8	0 No	
	43 F	No			No			0	
	69 M	Yes	1 SA		2 Yes	SA	1.4	2 No	
	22 M	Yes	1 SA		2 Yes	SA	1.8	0 No	
	73 M	Yes	1 SA		1.6 No			0 Yes	1.2
	55 M	No			No			0	
	65 F	Yes	1 GDA		1.7 No			0 No	
	38 M	Yes	1 GDA		1.5 No			0 No	
	24 M	No			Yes	SA	1.3	0	
	57 F	No			No			0	
	18 M	No			Yes	SA	1.5	0	
	58 M	Yes	1 CHA		3 Yes	SA	1.9	0 No	
	59 M	Yes	1 Repl	aced RHA	1.7 Yes	SA	1.6	2 No	
	60 M	Yes	1 IPDA		2 Yes	Sa	2.8	0 No	
	23 M	Yes	1 SA		2.2 No			0 No	

S. No. AIIMS ID	Age	Sex	DPA - Present?	DPA - Number? D	PA- Origin	DPA - Calibre GPA	A - Present? (	GPA - Origin?	GPA - Calibre	Type Of Arcade Uncinate Proces	s Branch of DPA	Calibre?
441 2022/07/001089		40 M	No			No				0		
442 2022/07/004016		27 M	Yes	1	A	1.9 Yes		SA	2	1 No		
443 2021/12/015443		34 M	Yes	1 S.	A	2.3 Yes		SA	2.7	1 No		
444 2022/07/001996		30 M	No			Yes		SA	1.5	0		
445 2022/07/004644		37 M	No			No				0		
446 2022/07/004617		18 M	Yes	1 S.	A	2.5 No				0 No		
447 2022/07/004556		52 M	Yes	1 S	MA	3.3 Yes		SA	2	1 No		
448 2022/07/000305		53 M	Yes	1 S	MA	2.6 No				0 Yes		1.1
449 2022/06/021366		43 M	Yes	1 St	MA	2.1 Yes		SA	1.4	2 No		
450 2022/07/003866		48 M	No			No				0		
451 2022/06/011655		60 M	Yes	1 S.	A	2 Yes		SA	1.5	3 Yes		1.5
452 2022/07/003791		50 F	No			No				0		
453 2022/07/006420		77 M	Yes	1 S.	A	2.3 No				0 No		
454 2022/07/007705		37 M	Yes	1 S.	A	1.9 No				0 Yes		1.9
455 2021/07/003049		64 F	Yes	1 S.	A	2 Yes		SA	1.8	0 No		
456 2022/07/007399		73 M	No			No				0		
457 2022/07/008760		55 F	Yes	1	A	1.7 Yes		SA	1.6	2 Yes		1.4
458 2022/04/004033		42 F	Yes	1 S.	A	1.4 No				0 No		
459 2022/07/008781		50 M	Yes	1 S.	A	1.8 No				0 Yes		1.2
460 2022/07/008716		47 M	Yes	1 S.	A	2.8 No				0 No		
461 2022/07/006598		43 M	Yes	1 S.	A	1.8 Yes		SA	1.9	0 No		
462 2022/03/015543		56 M	No			Yes		SA	2.2	0		
463 2022/07/005207		10 F	Yes	1 0	НА	2.2 No				0 No		
464 2022/07/007081		66 M	Yes	1 S.	A	1.6 Yes		SA	2	0 No		
465 2022/07/010860		17 M	No			N				0		
466 2022/07/011004		23 M	Yes	1 S.	A	1.3 Yes		SA	1.2	0 No		
467 2022/07/010910		75 M	No			No				0		
468 2022/07/011577		24 F	Yes	1 S.	A	3 Yes		SA	1.5	0 No		
469 2022/07/011362		24 M	Yes	T U	НА	1.8 No				0 No		
470 2022/06/019890		35 M	No			Yes		SA	2.4	0		
471 2018/11/006328		59 M	Yes	1 S.	A	2.2 No				0 No		
472 2022/01/020034		56 F	Yes	1 IF	PDA	2.7 No				0 No		
473 2022/07/000305		53 M	Yes	1 S	MA	2.5 No				0 No		
474 2022/06/004792		47 M	No			N				0		
475 2022/07/012388		78 M	Yes	1 S.	A	2.9 No				0 No		
476 2021/09/000409		53 M	Yes	1 S	MA	2.9 No				2 Yes		1.7
477 2022/03/021629		56 M	Yes	1 S.	A	1.7 No				0 No		
478 2022/07/013275		31 M	No			No				0		
479 2022/07/012445		65 M	Yes	1	НА	1.7 No				0 Yes		1.2
480 2022/07/012105		65 F	Yes	1 C	НА	1.9 No				0 No		

Calibre?						1.2	1.3									1.6																					1.4			
GPA - Calibre Type Of Arcade Uncinate Process Branch of DPA	0	1.5 0	1.3 0 No	1.9 0	0	1 3 Yes	1.4 2 Yes	0	0 No	1.6 2 No	0	3.1 1 No	0	0	0 No	1.2 3 Yes	1.2 2 No	1 No	0 No	0	1.6 0 No	2.2 3 No	0	1.8 0	1.2 0	1.9 0 No	2 0 No	1.2 0 No	0 No	1.5 2 No	0 No	0 No	0	0	1.6 2 No	0	0 Yes	1.5 0	2.2 0	1.8 0 No
GPA - Origin?		SA	SA	SA		SA	SA			SA		SA				SA	SA				SA	SA		SA	SA	SA	SA	SA		SA					SA			SA	SA	SA
DPA - Calibre GPA - Present?	No	Yes	1.7 Yes	Yes	No	1.7 Yes	1.8 Yes	No	2.2 No	2 Yes	No	2.1 Yes	No	No	3.2 No	2.4 Yes	2.5 yes	1.6 No	2.2 No	No	1 yes	2 Yes	No	Yes	Yes	2.8 Yes	2.3 Yes	1.9 Yes	1.5 No	1.8 YES	1.8 No	3 No	No	No	3.9 Yes	No	2.6 No	yes	Yes	1.2 Yes
PA - Number? DPA- Origin			1 SMA			1 SA	1 SA		1 SA	1 SMA		1 SA			1 CHA	1 SA	1 SMA	1 SA	1 IPDA		1 SA	1 SA				1 CA	1 SA	1 SA	1 SA	1 SMA	1 CA	1 SMA			1 SA		1 SA			1 SA
DPA - Present? D	No	No	Yes	No	No	Yes	Yes	No	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	No	No	Yes	No	Yes	No	No	Yes						
ge Sex	30 F	62 F	37 M	57 M	60 M	56 M	46 M	60 M	10 M	64 M	63 M	65 M	45 F	50 M	38 M	28 M	83 M	19 M	51 M	56 F	69 M	42 M	3 M	78 M	51 M	58 F	60 M	28 M	70 M	44 M	25 M	31 M	25 M	80 F	55 F	89 M	35 M	45 M	81 M	45 F
S. No. AIIMS ID A	481 2022/07/013068	482 2022/07/001011	483 2022/07/011603	484 2022/06/021436	485 2022/07/012072	486 2021/08/015083	487 2016/12/007763	488 2022/02/007995	489 2022/07/016257	490 2021/12/007955	491 2022/07/001910	492 2022/07/017799	493 2022/07/016809	494 2022/07/014213	495 2022/07/017603	496 2022/07/016656	497 2022/07/014250	498 2022/07/018066	499 2022/07/003765	500 2022/07/017599	501 2020/12/001365	502 2022/07/016300	503 2022/07/018014	504 2018/03/007251	505 2022/07/016005	506 2022/07/016809	507 2022/07/018169	508 2022/07/016100	509 2022/06/013511	510 2022/07/019107	511 2022/07/017045	512 2022/07/017760	513 2022/07/018628	514 2022/07/019936	515 2022/05/020329	516 2022/07/018394	517 2022/08/004812	518 2022/08/004989	519 2022/07/001256	520 2022/08/006325

S. No. AIIMS	SID	Age	Sex	DPA - Present?	DPA - Number? DPA- Origin	DPA - Calibre GPA - Present? GPA - Origi	in? GPA - Calibre T	Type Of Arcade Uncinate Process Branch of DPA C	Calibre?
521 2022/	/06/021302		39 M	Yes	1 SA	1.8 Yes SA	1.1	2 Yes	1.1
522 2022/	/08/002383		65 F	Yes	1 GDA	1.4 Yes SA	1	0 No	
523 2022/	/08/005562		62 F	Yes	1 SA	1.3 Yes SA	1.6	0 Yes	1.3
524 2022/	07/004616		51 F	No		Yes SA	2.2	0	
525 2022/	/08/007014		30 F	Yes	1 SA	1.6 yes SA	1.2	0 No	
526 2022/	/05/003033		48 F	Yes	1 CA	2.2 Yes SA	1.2	0 Yes	1.1
527 2022/	/08/006755		65 M	No		No		0	
528 2021/	12/003650		60 M	Yes	1 SMA	1.5 Yes SA	1.4	0 No	
529 2022/	/08/007531		32 M	No		Yes SA	2.3	0	
530 2022/	/08/005006		26 F	No		Yes SA	1.3	0	
531 2022/	/07/021442		68 M	Yes	1 SA	1.9 Yes SA	1.9	0 No	
532 2021/	657800/00		63 M	No		Yes SA	2.5	0	
533 2022/	/08/006488		82 M	Yes	1 SMA (J)	2.2 No		0 No	
534 2022/	660800/50,		22 M	Yes	1 GDA	2.1 Yes SA	1.9	3 No	
535 2021/	(07/004803		64 F	No		No		0	
536 2022/	/08/002659		47 M	No		No		0	
537 2016/	02/004011		48 M	Yes	1 SMA	1.5 No		0 No	
538 2022/	/08/007034		52 M	No		No		0	
539 2022/	68/00/80/		75 M	No		yes SA	2.2	0	
540 2022/	07/018870		23 F	No		Yes SA	1.2	0	
541 2022/	/08/006450		65 F	No		Yes SA	1.9	0	
542 2022/	/07/019828		31 M	Yes	1 SMA	3.5 Yes SA	2	0 No	
543 2022/	/08/009274		20 M	Yes	1 SA	2.5 Yes SA	1.6	0 No	
544 2022/	/08/004890		55 M	No		No		0	
545 2022/	/06/022631		69 F	No		No		0	
546 2022/	/08/008342		67 M	Yes	1 CHA	2.2 No		0 No	
547 2022/	/06/007767		69 M	Yes	1 SA	2.1 No		0 Yes	1.6
548 2022/	/06/019956		16 F	Yes	1 SA	2.6 Yes SA	1.5	0 No	
549 2021/	088200/60/		47 F	Yes	1 IPDA	1.8 No		0 No	
550 2022/	/07/018099		59 M	Yes	1 SMA	2.1 Yes SA	1.9	0 Yes	1.7
551 2022/	/08/008350		64 F	Yes	1 SMA (J)	1.5 No		0 No	
552 2016/	/07/007391		73 M	Yes	1 SA	2.2 Yes SA	2.1	0 No	
553 2022/	/07/017135		51 M	No		No		0	
554 2022/	/08/009474		50 F	No		Yes SA	1.2	0	
555 2022/	/08/012699		23 M	Yes	1 SA	1.3 yes SA	0.8	2 No	
556 2022/	/08/012547		54 M	No		No		0	
557 2022/	/08/008790		62 M	Yes	1 SA	2.7 No		0 No	
558 2022/	/08/012549		73 M	Yes	1 SA	1.7 Yes SA	1.9	0 Yes	1.4
559 2022/	/07/006737		65 M	No		yes SA	1.6	0	
560 2022/	/08/007696		70 M	Yes	1 SMA	1.9 No		0 No	

S. No. AIIMS ID	Age	Sex	DPA - Present?	DPA - Number? DPA- Orig	in DPA - Calibre GPA - Present?	GPA - Origin?	GPA - Calibre Type Of Arc	ade Uncinate Process Branch of DPA	Calibre?
561 2022/08/012410		54 F	Yes	1 SA	1.3 Yes	SA	1.5	0 Yes	1.1
562 2022/04/013371		58 M	No		No			0	
563 2022/08/013813		67 M	No		Yes	SA	1.5	0	
564 2022/05/016276		60 M	Yes	1 SA	1.9 No			0 No	
565 2022/08/015000		65 M	No		N			0	
566 2022/08/014801		31 M	Yes	1 SA	2.4 No			0 No	
567 2022/08/012690		22 M	No		yes	SA	1.9	0	
568 2022/02/011041		59 M	No		Q			0	
569 2021/04/001071		46 M	ou		Q			0	
570 2022/08/007681		72 M	Yes	1 SMA	2.2 No			0 No	
571 2022/08/011800		66 M	Yes	1 IPDA	2 Yes	SA	1.7	3 Yes	1.2
572 2020/08/004722		47 M	Yes	1 SA	1.4 Yes	SA	1.4	0 Yes	1.2
573 2016/04/005464		67 M	Yes	1 SA	1.8 Yes	SA	2.2	0 No	
574 2022/08/015962		25 M	Yes	1 CA	1.8 yes	SA	2.5	2 No	
575 2022/08/012312		63 M	No		Yes	SA	1.6	0	
576 2022/08/013563		22 M	No		Q			0	
577 2022/08/015373		47 M	No		Q			0	
578 2019/05/004296		53 M	Yes	1 SA	1.5 Yes	SA	1.8	0 No	
579 2022/08/016701		47 M	No		yes	SA	1.2	0	
580 2022/08/017533		22 M	Yes	1 SA	3.6 Yes	SA	1.7	2 Yes	1.7
581 2022/08/018556		25 M	Yes	1 SA	2.6 No			0 Yes	1.8
582 2022/08/016092		52 M	Yes	1 GDA	1.8 Yes	SA	1.4	0 No	
583 2022/08/014883		53 M	Yes	1 SA	1.6 Yes	SA	1.8	0 No	
584 2022/08/019212		80 F	Yes	1 CHA	2.4 Yes	SA	3	0 No	
585 2022/08/017216		54 M	No		N			0	
586 2022/08/004230		62 M	Yes	1 SMA	1.9 No			0 No	
587 2022/08/013971		35 M	No		Yes	SA	1.6	0	
588 2022/08/019606		63 m	Yes	1 CHA	2.4 No			0 No	
589 2021/02/006166		74 M	No		Yes	SA	1.8	0	
590 2022/08/019023		50 M	Yes	1 SMA	2.3 Yes	SA	1.7	1 No	
591 2022/08/001592		60 M	Yes	1 SMA	2.3 Yes	SA	1.9	2 No	
592 2022/05/021824		49 F	No		No			0	
593 2022/08/020068		40 M	Yes	1 GDA	1.6 Yes	SA	1	0 No	
594 2022/08/018279		49 M	Yes	1 SA	2.5 No			0 No	
595 2021/10/000098		53 M	Yes	1 SA	3 Yes	SA	2.6	0 No	
596 2022/08/006158		79 M	No		No			0	
597 2022/06/0200023		29 M	Yes	1 SA	1.5 Yes	SA	1.5	1 No	
598 2022/08/005050		38 M	No		Yes	SA	1.6	0	
599 2022/08/018922		80 M	Yes	1 SMA	2.3 Yes	SA	2.1	0 No	
600 2022/08/015720		50 M	No		yes	Sa	2.2	0	

ess Branch of DPA Calibre?		1.1		1.6	1.3				1	1				1.8	1.7											1.3			1											
Type Of Arcade Uncinate Proce	3 0	0 Yes	0	9 0 Yes	2 Yes	5 0	5 0 No	0	1 0 Yes	5 3 Yes	5 0 No	3 0	5 0 No	5 0 Yes	6 0 Yes	0 No	8 0	2 0	0 No	6 0	2 0	4 0	3 0	0 No	0	0 Yes	0 No	0 6	0 Yes	2 0 No	0 No	8 0	7 0 No	0 No	9 2 No	0	7 0 No	2 0 No	0	•
GPA - Origin? GPA - Calibre	SA 1.3			SA 0.9		SA 1.1	SA 1.1		SA	SA 1.1	SA 1.1	SA 1.3	SA 1.1	SA 1.1	SA 1.(		SA 1.8	SA		SA 1.(	SA 2.3	SA 1.	SA 2.3					SA 1.5		SA		SA 1.8	SA 1.	SA 0.9	SA 1.5		SA 1.1	SA 2.3		
DPA - Calibre GPA - Present?	Yes	1.8 No	No	2.6 Yes	1.9 No	Yes	2.2 Yes	No	1.8 Yes	2.5 Yes	1.3 Yes	Yes	1.8 Yes	2.6 Yes	2.7 Yes	1.5 No	Yes	Yes	1.8 No	Yes	Yes	Yes	Yes	1.5 No	No	2.9 No	2.1 No	Yes	2.1 No	2.7 Yes	2 No	Yes	1.2 Yes	1.8 Yes	2.6 yes	No	2.2 Yes	2.4 Yes	No	
DPA - Number? DPA- Origin		1 SMA		1 SA	1 SMA		1 SA		1 CHA	1 SA	1 SMA		1 SA	1 SMA	1 SA	1 SA			1 SA					1 SA		1 SA	1 SA		1 SA	1 CHA	1 SA		1 CHA	1 SA	1 SMA		1 SA	1 SMA		
DPA - Present?	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No	yes	Yes	Yes	No	Yes	Yes	No	
Age Sex	45 M	72 M	59 M	62 F	50 M	52 M	76 M	67 M	19 F	75 M	21 M	49 M	75 M	33 M	40 M	12 M	42 M	58 F	65 M	25 M	30 F	52 F	61 M	45 F	48 M	49 M	75 M	42 M	60 M	40 M	47 F	51 M	63 M	65 M	73 M	16 M	25 M	32 F	61 M	
No. AIIMS ID	601 2022/08/019094	602 2022/08/021533	603 2022/08/016946	604 2022/09/000857	605 2022/08/001223	606 2022/07/019375	607 2022/09/000748	608 2022/08/020905	609 2022/07/013425	610 2022/09/000923	611 2022/08/021815	612 2021/06/003576	613 2022/05/015405	614 2022/09/000515	615 2022/09/002325	616 2022/09/004518	617 2022/08/016801	618 2022/09/005055	619 2022/03/017855	620 2022/08/019866	621 2022/08/001225	622 2022/09/002731	623 2022/08/020393	624 2022/08/010695	625 2022/09/005354	626 2018/07/010640	627 2022/09/004819	628 2022/09/004592	629 2022/08/005012	630 2022/09/003293	631 2022/09/006249	632 2021/04/002646	633 2022/08/020013	634 2019/11/012831	635 2022/09/006111	636 2022/09/007483	637 2022/09/005396	638 2022/07/003751	639 2022/03/021356	and and and and
IMS ID	Age	77 M	DPA - Present? Vec	DPA - Number?	DPA- Origin	DPA - Calibre GPA - Present	:? GPA - Origin?	GPA - Calibre 1	Type Of Arcade Uncinate Process Branch of DPA	Calibre?																														
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		M 7/	100			2 1C3		7.1	0 10																															
T92900/60/7		N N	Yes		I SA	1.8 NO			0 NO																															
2/08/021246		61 M	8			Q			0																															
2/09/006812		82 F	No			Yes	SA	2	0																															
2/09/008956		65 M	No			No			0																															
2/09/007605		39 F	Yes		I SMA	2.2 No			0 No																															
2/09/005608		29 M	Yes		I SMA	1.2 No			0 No																															
2/09/006462		50 f	Yes	.,	l SA	2.3 Yes	SA	1.9	0 Yes	1.5																														
2/08/000142		66 F	No			Yes	SA	1.5	0																															
2/08/019571		52 M	Yes		l SA	2.2 No			0 No																															
2/09/011131		23 M	Yes		I SMA	1.8 Yes	SA	1.6	3 No																															
2/09/007753		39 M	No			Yes	SA	1.9	0																															
2/08/009389		25 M	Yes		l SA	1.5 Yes	SA	1.2	0 No																															
2/08/017619		60 M	Yes		l SA	1.7 Yes	SA	2	0 No																															
2/01/012180		30 M	Yes	. ,	l SA	2.1 Yes	SA	1.9	0 No																															
2/09/008906		20 F	Yes		I SMA	2.1 Yes	SA	1.2	0 Yes	1.6																														
2/09/009122		70 F	No			Yes	SA	1.4	0																															
2/09/011212		40 M	Yes		L CHA	3.3 Yes	SA	1.5	0 Yes	1.																														
2/09/004744		52 M	Yes		l SA	1.4 yes	SA	1.9	0 No																															
2/09/002208		45 M	No			Yes	SA	1.6	0																															
2/07/006705		32 M	No			yes	SA	1.6	0																															
2/09/013877		25 M	Yes		I SMA	1.7 Yes	SA	1.7	0 Yes	1.5																														
2/09/012391		75 F	No			No			0																															
2/08/018943		10 M	Yes		L CHA	1.8 Yes	SA	1.5	0 No																															
2/09/009424		35 M	Yes	.,	l CA	3.9 No			0 No																															
2/09/003832		65 F	Yes		L CHA	2.5 No			0 Yes	1																														
2/09/011029		55 M	Yes		I IPDA	2.2 Yes	SA	1.5	3 No																															
2/08/021904		22 M	No			No			0																															
9/04/017229		47 M	Yes		l CA	1.7 Yes	SA	1.7	0 No																															
2/03/021398		57 M	No			Yes	SA	1.8	0																															
2/09/013861		47 M	No			Yes	Sa	1.6	0																															
2/09/012963		22 F	Yes		I SMA	1.6 No			0 No																															
1/06/014785		44 M	Yes		l SA	1.8 No			0 No																															
1/12/010389		59 M	Yes		l SA	1.8 No			0 No																															
2/09/008581		42 M	Yes		l SA	1.6 No			0 No																															
7/10/008466		36 M	No			No			0																															
2/09/002795		49 M	No			No			0																															
2/09/008620		46 F	Yes		l SA	1.7 Yes	SA	1.9	0 No																															
2/09/016225		15 M	No			Yes	SA	1.4	0																															
2/06/004383		50 F	Yes		I IPDA	2 No			0 No																															

of DPA Calibre?								1.5										1.2													0.9				1.7				
e Of Arcade Uncinate Process Branch	0 No	0	0 No	0	0	0	0 No	0 Yes	0 No	0 No	0 No	1 No	0 No	0	0	0 No	0 No	0 Yes	0 No	0 No	0 No	0	0	0	0	0 No	0	0 No	3 No	0	0 Yes	0 No	0 No	0	2 Yes	2 No	0		0
GPA - Calibre Typ			1.7	1.2		1.5	2.2	1.9			1.9	1.5				1.4	2.3	1.3	2.3				1.5	1.4	1.2	1.3	1.2	1.1	1.7	1.3	1.6	1.7	1.4			1.3	1.3		1.8
nt? GPA - Origin?			SA	SA		SA	SA	sa			SA	SA				SA	SA	SA	SA				SA			SA	SA		SA										
DPA - Calibre GPA - Preser	2.1 No	No	1.9 Yes	yes	No	Yes	1.3 Yes	2.1 yes	1.5 No	1.8 No	2 Yes	1.1 Yes	3.8 No	No	No	1.5 Yes	2.4 yes	1.5 Yes	2.2 Yes	1.5 No	1.7 No	No	Yes	Yes	Yes	1.8 Yes	Yes	2.9 Yes	1.4 Yes	Yes	1.8 Yes	3.1 Yes	1.7 Yes	No	2.3 No	1.5 Yes	Yes	;	Yes
DPA - Number? DPA- Origin	1 SA		1 SA				1 SMA (J)	1 CHA	1 SA			1 SA	1 SMA	1 SA	1 SA	1 SA	1 SA					1 SA		1 SA	1 SA		1 CHA	1 CA	1 SMA		1 SA	1 SA							
DPA - Present?	Yes	No	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No		No						
Age Sex	60 M	50 M	43 F	48 M	59 M	58 M	48 M	61 m	22 F	65 F	26 F	23 F	47 M	60 F	64 M	67 F	28 M	63 M	37 M	68 M	64 M	53 F	18 M	69 M	42 M	18 M	63 M	32 M	39 F	37 M	24 M	33 M	53 F	24 M	71 M	51 M	38 M		47 M
No. AIIMS ID	681 2022/07/011613	682 2022/09/009158	683 2022/08/005213	684 2022/09/017279	685 2022/09/010225	686 2022/09/018621	687 2020/09/010794	688 2022/08/008780	689 2022/09/019326	690 2022/09/019634	691 2022/09/018962	692 2021/12/008779	693 2019/12/006928	694 2022/09/018266	695 2021/06/002608	696 2016/05/002691	697 2022/09/019791	698 2014/10/002617	699 2022/09/019890	700 2016/06/003521	701 2022/09/017087	702 2022/09/008700	703 2022/09/018071	704 2022/06/022724	705 2022/09/017974	706 2022/07/020766	707 2022/09/009260	708 2022/09/021434	709 2022/09/014991	710 2022/09/009334	711 2022/07/011362	712 2022/09/021279	713 2022/05/015764	714 2022/10/000309	715 2022/09/023200	716 2021/11/008190	717 2022/10/000556		1 10 2U22/ 1U/UUUU4

Calibre?		1.4		0.9							2.2									1.3						0.9	
Uncinate Process Branch of DPA C	NO	) Yes	0 No	Yes	No	0 No			0 No	) No	t Yes		0 No		0 No			No	0 No	) Yes	) No			0 No	0 No	) Yes	NO
Type Of Arcade	0	0	0	2	2	0	0	0	0	0	e	0	0	0	0	0	0	m	0	0	0	0	0	0	0	0	0
GPA - Calibre				1.5	2.4		1.6		1.3		2.4	2	1.9		1.4	1.2	2.2	1.8					2.2				1.7
GPA - Origin?				SA	SA		SA		SA		SA	SA	SA		SA	SA	SA	SA					SA				SA
DPA - Calibre GPA - Present?	2.3 No	1.6 No	2.3 No	2.5 Yes	2 Yes	1.5 No	Yes	No	1.4 Yes	1.8 No	4.8 Yes	Yes	2.2 Yes	No	1.4 Yes	Yes	Yes	2 Yes	2.6 No	1.8 No	3.4 No	No	Yes	1.2 No	2 No	3.5 No	2.6 Yes
DPA- Origin	1 SMA	1 SA	1 SA	1 CA	1 AA	1 SA			1 SA	1 SMA	1 SMA		1 SA		1 SA			1 CA	1 CHA	1 SA	2 CA, IPDA			1 SA	1 SA	1 SA	1 SA
DPA - Number?																											
DPA - Present?	Yes	Yes	yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	No	No	yes	Yes	Yes	Yes
Sex	50 M	51 M	57 M	63 M	44 M	38 M	67 M	33 M	60 M	77 M	73 M	68 M	75 M	50 M	21 F	61 M	26 F	19 F	16 M	42 F	50 M	60 M	32 M	55 M	62 F	25 M	32 M
Age																											
AIIMS ID	721 2022/09/021609	722 2021/09/019360	723 2022/09/010053	724 2019/09/007463	725 2022/06/012001	726 2022/10/002248	727 2022/10/002023	728 2022/10/000618	729 2022/10/001803	730 2022/09/023592	731 2022/09/022843	732 2022/08/011343	733 2022/10/000703	734 2022/10/000625	735 2022/10/004228	736 2022/07/016277	737 2022/10/001893	738 2022/08/021105	739 2022/10/005205	740 2022/08/020366	741 2022/10/006656	742 2022/09/017716	743 2022/05/018284	744 2022/10/006696	745 2022/03/006413	746 2022/10/008324	747 2022/09/019829
S. No.																											