Installation of Vascular Interventional Lab for Animal Model Studies at PGIMER, Chandigarh: Beginning of a New Era

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Key goals for Installation of Biplane DSA at Our Institute

- Establishing the technical feasibility for selective catheterization of vessels for diagnostic angiography in animal models
- Teaching models for the resident doctors to understand the anatomical variations and catheterization techniques.
- Development of stroke and aneurysm models for research and device development.
- To perform selective catheterization in hepatic, renal, and peripheral vessels.
- To establish tumor models and see the effect of novel drugs through repeated angiographic/histopathological studies.

Initial Challenges with the Animal DSA Procedures

Animal Selection

It is crucial to select an appropriate animal model that could be easily handled, technically feasible to perform catheterization and a repeat study could be achieved. We selected the New Zealand white rabbit for this purpose. The main reasons were easy availability at our hospital, easy to handle the animal, similar coagulation profile and blood pressure to humans.[1]

In addition, the profile, size and diameter of rabbit neck vessels are similar to human cerebral vasculature. The New Zealand white rabbit is an already established experimental animal for research and innovation in neurovascular interventions.[1,2]

Anesthetic Considerations

One of the key challenges is to provide adequate anesthesia to animals for completion of the diagnostic or therapeutic research procedure. Many different types of anesthesia protocols have been described previously.[1–3] With limited experience and technical hardware for animal resuscitation, we had to decide on an anesthesia protocol that was feasible, safe, provides immobilization for 45 to 60 minutes, and the animal can be maintained on room air. New Zealand rabbits were anesthetized intramuscularly in the groin muscles (►**Fig. 1**) with ketamine HCl (50 mg/kg) and xylazine (5 mg/kg) and maintained on room air. This provides adequate sedation and immobilization for our procedures.

Animal Positioning

After sedation, it is important to place the animal in an adequate position for proper exposure of the vascular access site. For this, a custom-made wooden table was used that allowed each of the four extremities to be fixated with straps (►**Fig. 1**).

Vascular Access

Another key challenge is to get vascular access for selective catherization in New Zealand white rabbits as the vessels are tiny in diameter. We employed transauricular (►**Fig. 2**) and transfemoral (►**Fig. 3**) routes for access. The techniques for these have been previously described.[2,3] Transfemoral route requires a cut down procedure, which is technically challenging during the initial learning phases. A 3F sheath or 18 G cannula was used for the initial puncture and arterial access.

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Fig. 1 (**A**) Intramuscular injection of anesthetic agents to the New Zealand white rabbit. (**B**) Securing the limbs prior to procedure on the custom-made wooden holding table.

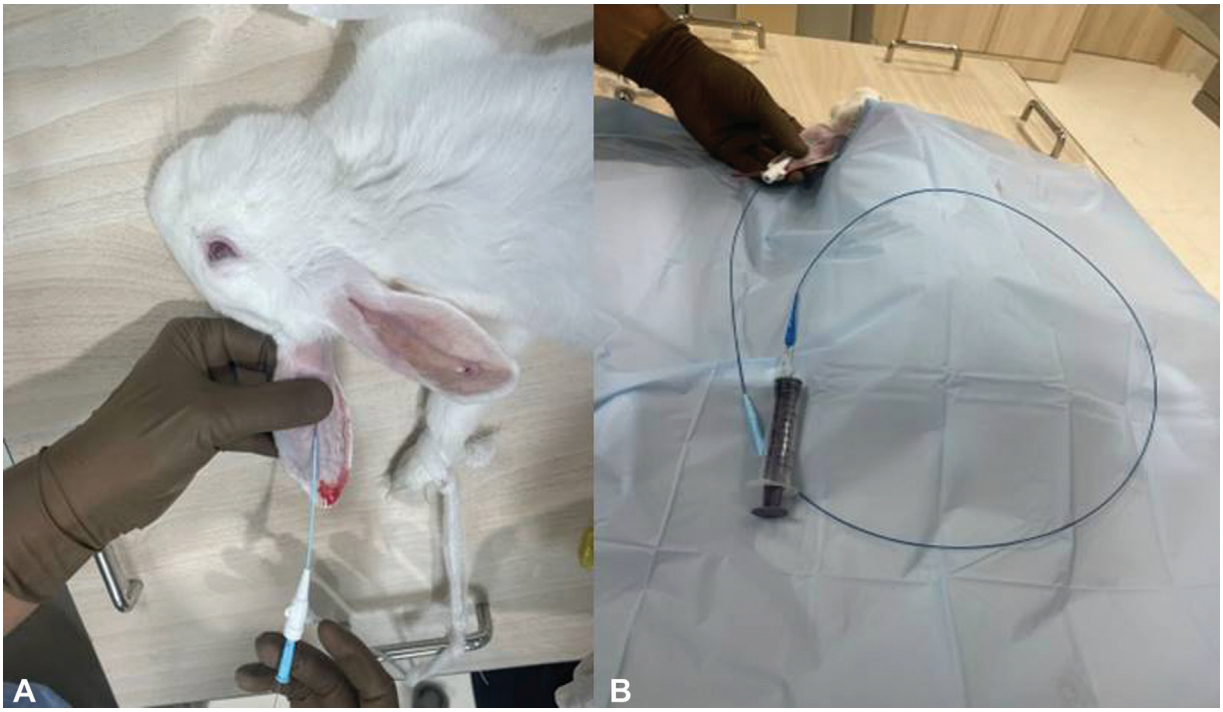

Fig. 2 (**A**) The presence of a 3F sheath in the central auricular artery of the left ear. (**B**) Placement of a 1.7-F microcatheter through the 3F sheath for selective angiography.

Selective Catheterization

Maneuvering the catheter in small vessels is challenging initially and requires technical expertise. Using 3-F catheters or coaxial systems with 1.7-F or 1.9-F micro catheters, we could easily navigate and perform intracranial angiography with excellent images (►**Fig. 4**). The technical steps for selective catheterization of intracranial vessels have been previously described.[2,3]

Current Projects

Multiple projects are currently running from the department of Radio-diagnosis and Imaging that are approved by the institutional animal ethical committee.

These include performing transfemoral angiography, transauricular angiography, to study variations of Circle of Willis in New Zealand white rabbits and creation of aneurysm flow models.

Fig. 3 (**A**) The presence of a 3F sheath in the right femoral artery after careful dissection. (**B**) Placement of a 1.7-F microcatheter through the 3F sheath for selective angiography.

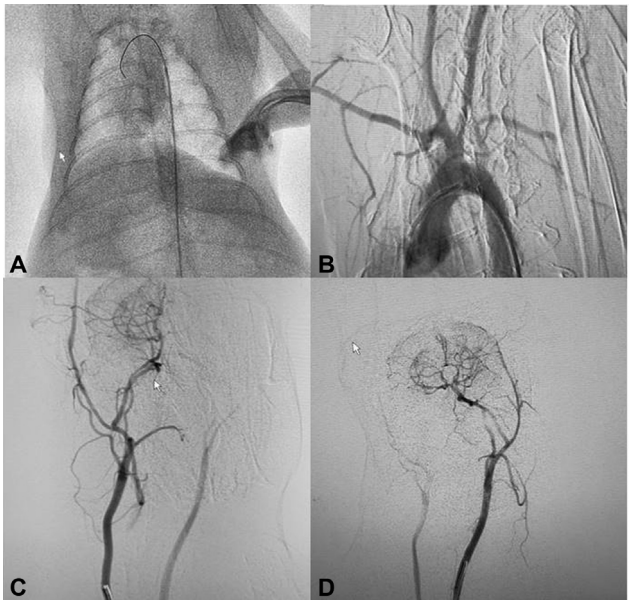

Fig. 4 (**A**) Fluoroscopic image showing guidewire and microcatheter in the arch of aorta. (**B**) Aortogram run shows opacification of major branches. Selective common carotid angiogram taken on right (**C**) and left (**D**) sides.

Conclusion and Future Direction

A vast literature is available depicting the clinical utility of pre-clinical studies performed on large animals.[4] With the establishment of biplane DSA, we hope for increasing our technical expertise in animal vascular procedures. The aim is to provide models for research and development to conduct pre-clinical studies.

Note

We state that this article has not been submitted to any other journal and is our original work.

Ethical Approval

Ethical approval was obtained from Department of Radiodiagnosis and Imaging, Post Graduate Institute of Medical Education & Research, Chandigarh, India.

Funding

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Conflict of Interest

None declared.

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