Center for Children's Surgery
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO
ANSCHUTZ MEDICAL CAMPUS

Research in Outcomes for Children's Surgery

Children's Hospital Colorado

Nuclear Shunt Study to Assess Shunt Function

Woro George MS[1], Keanu Chee MS[1], Michael Handler, MD[2]
[1]University of Colorado Anschutz Medical Campus, Aurora, CO | [2]Children's Hospital Colorado, Aurora, CO

Background

- Shunts, while seemingly intact, can develop fractures over time.
- Patients with fractures are often asymptomatic (no clinical signs of hydrocephalus), the question then becomes should these asymptomatic patients be operated on.
- The presence of a fracture/disconnection in the shunt system does not provide evidence that the shunt is non-functional, as there can be preserved flow along a tract within the body's soft tissues. Therefore, the assessment of shunt flow must be established
- Determination of shunt flow is carried out by a nuclear medicine (NM) study, which provides real-time radiotracer imaging to assess shunt function (flow v. no flow)

Objective

Evaluate the effectiveness of nuclear medicine shunt studies in guiding patient management decisions, particularly in determining the necessity for revision surgery.

Technique

Aseptically, a 25-gauge needle is used to withdraw CSF from the shunt reservoir, followed by the introduction of 0.3 mCi of the radiopharmaceutical In-111 DTPA. Real-time gamma camera imaging tracks the tracer's flow (or lack of) within the shunt system.

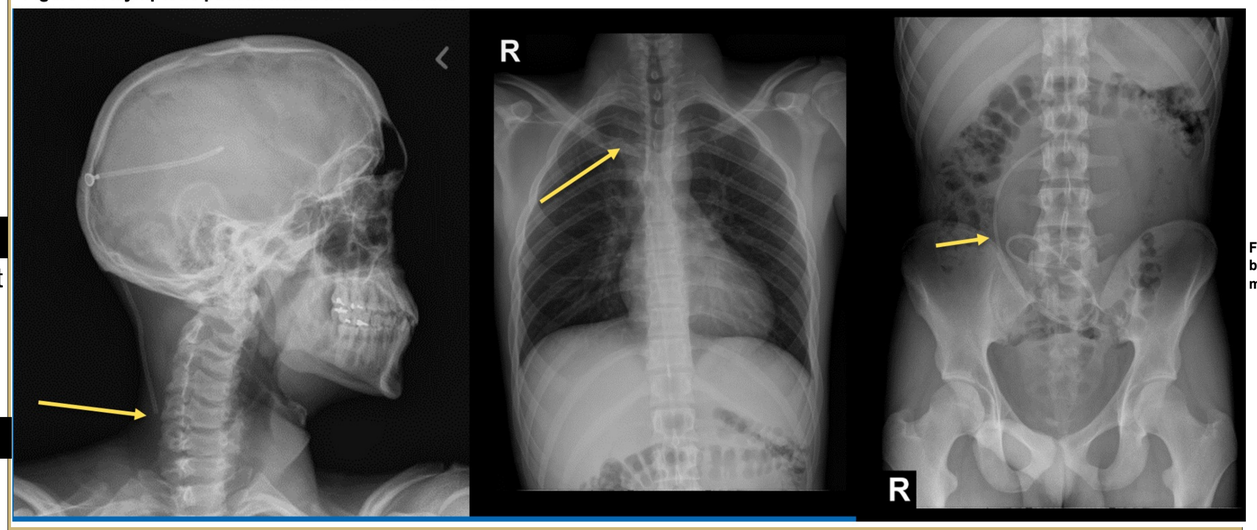
Methods/Results

- Retrospective chart review, from 2002 to 2023, data accessed through the CHCO electronic medical record and radiology PACS system.
- All patients with Ventriculoperitoneal (VP) shunts who had received nuclear medicine (NM) studies in the CHCO were identified.
- Patient demographics, including age, sex, imaging findings, and outcomes (revision or no revision), along with follow-up data, were recorded.
- 63 patients were identified. Two were eliminated for inadequate follow up data and one for unindicated NM study

Main Findings

Nuclear shunt studies, when performed correctly, are an accurate and invaluable tool in guiding patient management and the decision on whether to offer surgical revision.

Figure 1. Asymptotic patient with a fractured shunt



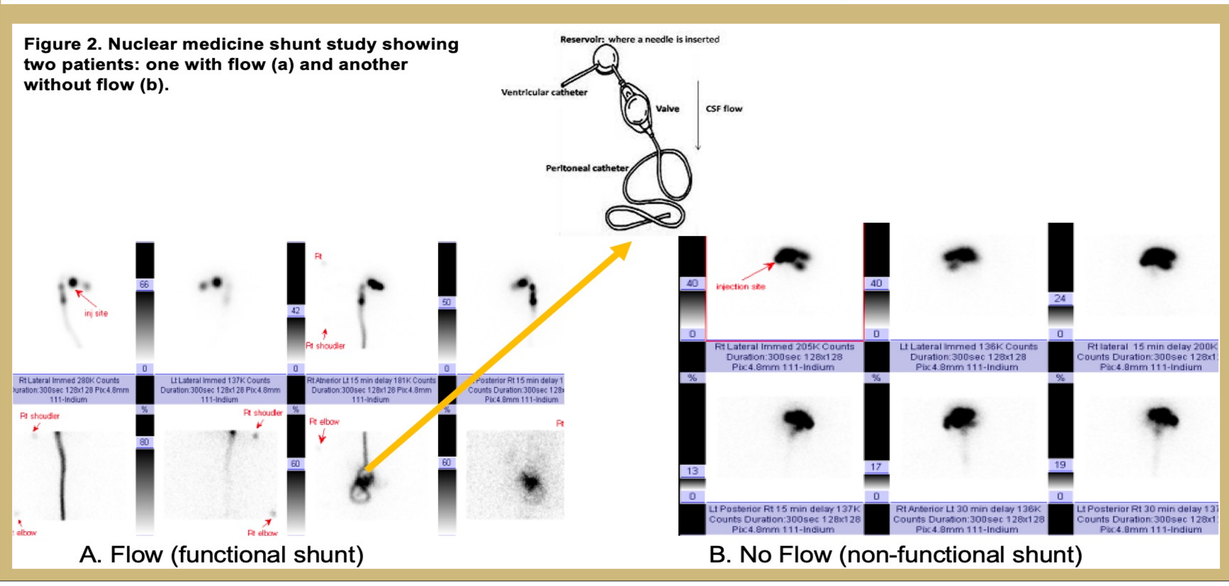


Figure 2. Nuclear medicine shunt study showing two patients: one with flow (a) and another without flow (b).

Results

Figure 3. Clinical outcomes of nuclear medicine study

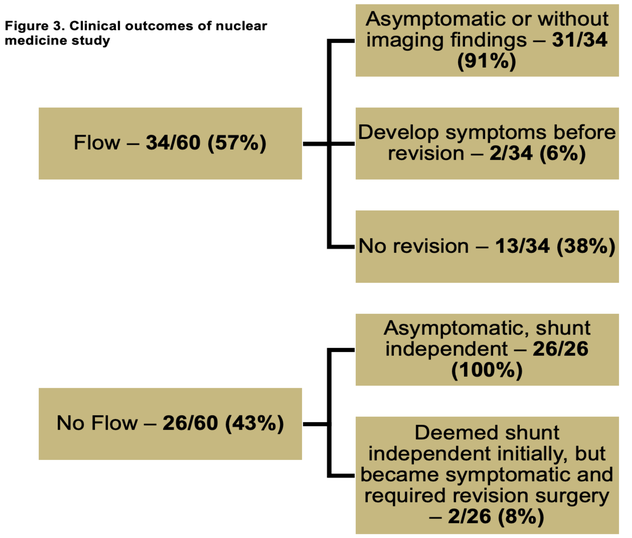
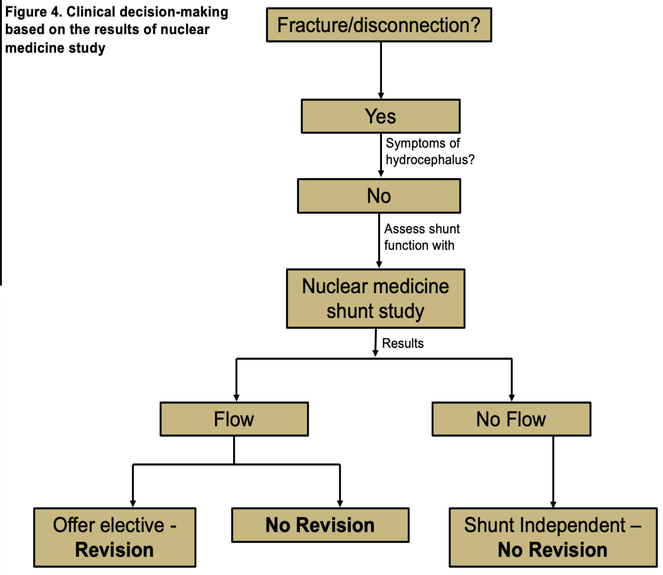


Figure 4. Clinical decision-making based on the results of nuclear medicine study



Conclusion

Our study supports the important role of NM shunt studies in guiding decisions regarding patient management, particularly in determining the need for surgical intervention (i.e., revision). NM shunt studies have the potential to improve clinical outcomes and should be considered part of routine clinical practice.