How good is clinical examination at detecting a significant patent ductus arteriosus in the preterm neonate?

Report by

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A 25 week gestation infant aged 30 days has a continuous murmur and easily palpable pulses. He has already received a course of indomethacin for a "clinically diagnosed" patent ductus arteriosus (PDA). The baby is ventilator dependent. How good (or bad) is clinical examination at diagnosing a clinically important PDA?

Structured clinical question

In a ventilator dependent neonate of very low birth weight (<1000 g) [patient], how good is clinical examination [intervention] at detecting patent ductus arteriosus [outcome]?

Search strategy and outcome

A search string of [patent arterial duct] AND [diagnostic test] was used.

Search results

PubMed—three papers.
Cochrane database—nil.
SUMSearch—nil other than PubMed articles.
Search done independently by DU and RN retrieved same three articles. See table 3.

Commentary

PDA is common in preterm babies. The EPICure study[4] documented the prevalence as 65% in babies born at less than 26 weeks who survive to discharge. However, the methods for diagnosing a PDA in this study were not specified. Therefore, the pretest probability of a ventilated preterm infant having a PDA is high.

In the study by Davis and colleagues,[1] a high percentage of patients with a PDA had no murmur. Bounding pulses were also a poor independent predictor for the presence of a PDA. We can also calculate post-test probability for patent ductus arteriosus using the likelihood ratios (LRs) from this study. For presence of a murmur alone, if we assume a pretest probability of 65%,[4] and positive LR of 3.23, then our post-test probability is increased to 86%. However, if no murmur is present and negative LR is 0.67, post-test probability falls only to 55%.

For an increased pulse volume, with a pretest probability of 65%, post-test probability is increased to 75% when there are bounding pulses but falls only to 59% when bounding pulses are absent. Therefore echocardiography is required to confirm or refute a diagnosis of PDA.

The paper by Skelton and colleagues[2] evaluated signs over a period of several days. The presence of a murmur was highly specific, but poorly sensitive in diagnosing patent ductus arteriosus. Hence, a murmur heard in a preterm infant is likely to be due to patent ductus arteriosus; however absence of a murmur does not exclude a PDA. Therefore to be confident of the diagnosis, echocardiography is essential.

The results of the Kupferschmid *et al* paper[3] were less valid, as they compared a group of 29 PDA patients with a control group, of whom 11 were patients from the original group that had subsequently undergone PDA ligation. The presence of a thoracotomy scar would preclude blinding. Twenty per cent of patients with a PDA had normal heart sounds and 10% had normal pulses on assessment. No gold standard was applied, with definitive diagnosis of PDA made from either operative, postmortem, or aortography findings.

Table 3 Detection of patent ductus arteriosus in the preterm neonate

Citation	Study group	Level of evidence	Outcome	Key results	Comments
Davis *et al* (1995)	100 babies <1750g studied between day 3 and day 7 of life	Level 1b	Detection of PDA by clinical examination versus echocardiography (gold standard)	*Murmur* LR+ 3.23 (CI 1.2, 10) LR– 0.67 (CI 0.53, 0.93) *Bounding pulses* LR+ 1.65 (CI 0.79, 3.53) LR– 0.77 (CI 0.48, 1.16)	Clinical signs poor predictors of PDA
Skelton *et al* (1994)	55 babies <1500g studied in the first 7 days of life	Level 1b	Detection of PDA by clinical examination versus echocardiography (gold standard)	*Murmur* LR+ ranges from 3 to 14 in first 7 days (CI 0.8–5, 9.1–22) LR– ranges from 0 to 0.8 in first 5 days (CI 0.1–0.5, 0.8–1.2) *Bounding pulses* LR+ ranges from 0.3 to 6 in first 7 days (CI 0–3, 2–12) LR– ranges from 0 to 1.3 in first 5 days (CI 0.1–1.0, 1–1.7)	Clinical signs poor at detecting PDA in first 4 days of life. Echocardiography is required for reliable early diagnosis of PDA
Kupferschmid *et al* (1988)	47 babies 1. Cases: 29 with PDA 2. Controls: 29 without PDA of whom 11 were drawn from group 1 following duct ligation	Level 4	Detection of PDA by clinical examination, echo and Doppler. No gold standard	*Murmur* 80% sensitivity (95% CI 60, 92) *Bounding pulses* 90% sensitivity (CI 73, 98) Unable to calculate LRs as specificity not stated	Concerns re blinding in view of how controls were obtained. Clinical signs are poor predictor of PDA

Post-test probability suggests that clinical evaluation of PDA either by auscultation or by palpation of pulses is of limited value. Echocardiography is the method of choice for diagnosing a patent arterial duct.

CLINICAL BOTTOM LINE

- Clinical evaluation of PDA, either by auscultation or by palpation of pulses, is of limited value (with likelihood ratios between 0.3 and 6).
- In the extremely low birthweight neonate, Doppler flow echocardiography is required to confidently rule in or rule out the diagnosis of PDA.

REFERENCES

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3 **Kupferschmid C**, Lang D, Pohlandt F. Sensitivity, specificity and predictive value of clinical findings, m-mode echocardiography and continuous wave Doppler sonography in the diagnosis of symptomatic patent ductus arteriosus in preterm infants. *Eur J Pediatr* 1988;**147**:279–82.
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