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Arch. Dis. Child. 2002;87;331-332
doi:10.1136/adc.87.4.331

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SHORT REPORT

Pigtail catheter drain in the treatment of empyema thoracis

M J Pierrepont, A Evans, S J Morris, S K Harrison, I J Doull

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We compared the outcome of children with empyema managed either through thoracotomy with pleural debridement, conventional stiff chest drain, or pigtail chest drain. Compared to conventional drain, children who received either thoracotomy or pigtail catheters had a significantly decreased period of drain in situ, were afebrile earlier, were clinically improved earlier, and were discharged earlier.

Pneumonia in childhood is often associated with parapneumonic effusion. Such effusions usually resolve with appropriate treatment, but on occasion may become complicated and develop into an empyema. Treatment options range from plain tube thoracocentesis to thoracotomy with pleural debridement. There is currently considerable debate over the relative benefits of medical¹ or surgical² management, with polarised views. Increasing evidence in adults^{3,4} and children¹ suggests that intrapleural instillation of fibrinolytic agents augments pleural drainage. A recent controlled trial of intrapleural urokinase in empyema of childhood suggested additional benefit from the use of pigtail catheters compared with conventional stiff drain.¹ As a result we changed our management to incorporate pigtail catheters, and describe our experience.

SUBJECTS AND METHODS

We retrospectively reviewed all cases of empyema under our care between January 1998 and August 2001. We used a pragmatic definition of empyema—a chest radiograph showing pneumonia with significant pleural fluid; with evidence on ultrasound of intrapleural loculations; with pyrexia (temperature >38.0°C) for more than 48 hours despite appropriate parenteral antibiotics. Prior to January 2001 we managed children with empyema either through thoracocentesis via a conventional stiff chest drain and urokinase, or through primary surgical thoracotomy with pleural debridement and

drain insertion. From January 2001 onwards all cases were managed by a pigtail catheter (Dawson-Mueller, Cook, UK) inserted by a paediatric radiologist under ultrasound guidance. Pigtail catheters were inserted under general anaesthesia in children less than 4 years of age, and under conscious sedation for children aged 4 and over. Use of urokinase has not changed since 1998. Urokinase 40 000 IU is instilled into the pleural space every 12 hours, with a dwell time of four hours, followed by eight hours of suction at 20 cm H₂O. The cycle of urokinase instillation is continued as clinically indicated.

Outcome measures were time (in days) from onset of symptoms to procedure (thoracotomy, stiff drain, or pigtail); time in hospital prior to procedure; time a drain was in situ; time from procedure to being afebrile (temp <38°C for >24 hours); time from procedure to being improved (recorded in notes that parents felt child improved); and time from procedure to discharge. We also recorded need for secondary thoracotomy, and need for repositioning or replacing the drain.

We compared three groups of children: (1) primary surgical thoracotomy and pleural debridement; (2) conventional stiff chest drain and urokinase; and (3) pigtail catheter chest drain and urokinase. Data were log transformed prior to analysis, and are presented as the geometric mean. Analysis of variance was utilised for the transformed data, the χ^2 test for categorical data, or Fisher's exact test for small groups.

RESULTS

Over 31 months, 24 children with an empyema were admitted under our care. One child managed conservatively responded to intravenous antibiotics without need for a drain. Seven children (mean age 7.3 years, range 1.9–12.7) had a primary thoracotomy, seven had conventional stiff drain inserted (mean age 4.6 years, range 1.9–11.2), and nine had a pigtail drain inserted (mean age 7.1 years, range 2.1–12.3). Children receiving primary thoracotomy were symptomatic for significantly longer prior to the procedure (table 1). Compared to the conventional stiff drain, either primary thoracotomy with pleural debridement or pigtail catheter insertion were associated with significantly decreased period of drain in situ, time

Table 1 Outcomes following primary surgical thoracotomy with pleural debridement, stiff drain insertion, or pigtail drain insertion

	Number of days (geometric mean)			p value
	Group 1	Group 2	Group 3	
Symptoms before procedure	16.9	8.5	11.2	0.02*
Hospital before procedure	2.6	3.6	4.1	0.9*
Drain in situ	5.0	11.5	4.9	0.002*
Patient afebrile	2.4	10.7	4.1	0.002*
Patient improved	2.5	6.9	1.8	0.02*
Procedure to discharge	6.9	15.3	5.6	0.002*
Secondary thoracotomy		6/7	0/9	0.001†
Drain adjust/replace	2/7	6/7	2/9	0.05‡

*ANOVA; †Fisher's exact test; ‡ χ^2 test.

to becoming afebrile, time to improvement, and procedure to discharge. Children with a stiff drain were significantly more likely to require secondary thoracotomy, or need repositioning or replacing of the drain than children who received a pigtail catheter.

DISCUSSION

We have shown striking benefits from using a pigtail catheter compared to a conventional stiff drain in the management of childhood empyema. The pigtail catheter is considerably smaller bore than a conventional chest drain, and in our experience is much less traumatic to insert, with a noticeably smaller residual scar. Our findings may therefore seem surprising at face value. However, we believe that a number of factors contribute to its improved efficiency: the size of drainage fenestrations is considerably larger in the pigtail catheter compared to conventional drain; unlike a conventional stiff drain, the pigtail catheter does not completely occlude when kinked; the fixing system to the skin of the pigtail catheter is much more secure than conventional drains; and this in combination with the ease of insertion, results in much less pain and discomfort while in situ; consequently the child is easier to mobilise (thought to be important in dispersing the urokinase within the pleural space).

We have effectively compared our current management with historical controls, and therefore cannot exclude the possibility that our findings reflect time trends in management or disease aetiology. We believe this unlikely, as other than the change to pigtail catheters, our management did not change over the study period and the time period was too short for significant changes in disease aetiology.

In our population pigtail catheter insertion compared favourably with formal thoracotomy. However, pigtail catheter insertion offers significant cosmetic advantages, and in our experience results in considerably less discomfort. We did not collect detailed follow up data, and it is possible that there may be long term radiological or pulmonary function benefits that we could not determine. Nevertheless our findings show clear benefits for pigtail catheters compared to conventional stiff drains, and we feel that insertion of such drains is preferable to thoracotomy and is now the treatment of choice.

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Accepted 9 May 2002

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