



Fig. 3. Estimation of early gestational age by the fingerbreadths method.

fingerbreadths (N = 3) above the symphysis; all were due to a full bladder.

In view of these findings, the curve shown in Fig. 3 was established. Regardless of the condition of the bladder, it was found that the number of fingerbreadths above the symphysis allows the clinical estimation of the duration of pregnancy as follows: one fingerbreadth = 6 - 7 weeks, two = 9 - 10, three = 10 - 11, four = 11 - 12, and five = 13 - 14 weeks.

The preliminary results were validated in a prospective series of 353 women. The only difference was that two

fingerbreadths tallied with a gestational age of 8 - 9 weeks (instead of 9 - 10 weeks). There were 18 false-negatives (5.1%) and 31 false-positives (8.8%). The false-negatives occurred at a mean gestational age of 7.9 weeks (95% confidence interval (CI): 7.1, 8.7). The sensitivity was 93.2% and the specificity 65.6%. The positive predictive value was 88.8% and the negative predictive value 76.6%. Because some women with one or two fingerbreadths and a full bladder were found to be false-positive, it is recommended that these clients be asked to void, and that the clinical examination be repeated.

For practical purposes, a symphysis-fundus distance of more than three fingerbreadths suggests a pregnancy of 12 weeks and the patient should be referred to hospital for TOP, if that is the case. The method might be useful in PHC settings with no sonographic facilities to improve proficiency of clinical diagnosis of pregnancy and determination of early gestational age.

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1. Choice of Termination of Pregnancy Act No. 92. South African Government Gazette. Cape Town, 1996.
2. Department of Health. Guidelines for Maternity Care in South Africa. Pretoria: Department of Health, 2000: 20.
3. Theron GB. Problem orientated antenatal care. In: J Bassin, ed. Topics in Obstetrics and Gynaecology. Johannesburg: Julmar Communications, 1995: 29-35.
4. Crichton ED. Quoted in: Philpott RH. Graphic records in labour. *BMJ* 1972; 4: 163-164.

## Medical students' experiences of the autopsy

**To the Editor:** The autopsy is an important tool for medical training, research and audit. Unfortunately the autopsy rate has declined drastically worldwide over the last half century.<sup>1</sup> For example, in Sweden the rate fell from 46% in 1969 to 31% in 1993,<sup>2</sup> in North America from 50% in 1950 to as low as 7% in some hospitals in 1995,<sup>1</sup> and in France from 15% in 1988 to 4% in 1997.<sup>3</sup> Some students and medical practitioners consider the autopsy to be of little value.<sup>4,5</sup>

The value of the autopsy extends beyond ascertainment of the cause of death to quality control in medical practice, research and education, and the provision of epidemiological medical data. Many deaths occur without physicians knowing the cause. In 24 - 30% of perinatal deaths, autopsy was the sole means of establishing the diagnosis.<sup>6,8</sup> In cases where the diagnosis is supposedly ascertained by means of modern investigative technologies, studies have revealed that there is a relatively high rate of misdiagnosis. Seven to thirteen per cent of autopsies revealed a clinically missed major diagnosis that

might have led to a change in therapy.<sup>5,6,9,10</sup> Lowry expressed this well when he said that 'Failure to perform autopsies means some MD's are "walking in a fog of misplaced optimism"'.<sup>1</sup>

The purpose of this study was to assess the experience of medical students with regard to autopsy.

Data were collected by means of a self-administered questionnaire (validated previously),<sup>11</sup> which covered the objectives of the autopsy and students' experience of autopsies during medical training. Informed consent was obtained and the study approved by the Ethics Committee of the Medical University of Southern Africa (MEDUNSA).

Of 254 final year MB ChB students at MEDUNSA in 1998, 239 received questionnaires and 164 (65%) were available for the study. Seven students did not know what the objectives of autopsy were and 2 believed that the autopsy has little value today. The remaining responses were: 123 students (75%) considered the ascertainment of the cause of death to be the principal objective of autopsy, 58 (35%) indicated medical



research as an important purpose of autopsy, 46 (28%) believed that the autopsy has an important role to play in medical training, and 39 (24%) considered the autopsy to be useful in the control of the effects of care and treatment. Only 21 students considered all four statements to be legitimate objectives of the autopsy. The mean number of answers was  $1.65 \pm 1.15$ .

During their medical training, 108 students (66%) had never taken part in an autopsy procedure (as an assistant operator to the pathologist). Fifty-six had participated in 1 or more autopsies, of whom 31 students (19%) participated in more than 7 autopsies. On the other hand, all students had attended at least 1 autopsy demonstration with 44 attending 3 - 6, and 118 (72%) attending more than 7 autopsies. The minimum Faculty requirement is that students should attend forensic autopsies on four different occasions during their fourth year. There is no requirement that they should participate or that they should attend hospital autopsies. Two students attended only one autopsy.

Concerning their emotional reaction to their first autopsy, 33 students (20%) claimed not to have experienced any discomfort, while 16 (10%) had a reaction of revulsion. The large middle group (111, 68%) did not experience strong reactions, but felt uncomfortable. Ninety-five students (58%) found it to be of value, 32 (20%) found it not very rewarding, and 9 (5%) found it not rewarding at all.

Locally, the decline of the autopsy in medical practice has not attracted the attention of the profession. There are few studies on the autopsy<sup>12</sup> and practically no publications on the attitudes of people involved in conducting autopsies.

The question on the objectives of the autopsy may assess students' knowledge or may reflect their beliefs about the value of the autopsy regardless of teaching. Students considered establishment of the cause of death to be the most important objective of the autopsy, and less importantly, research, medical training and control of the effects of treatment. Other studies elicited similar ranking.<sup>2,5,11,13</sup> However, in our study the percentage of positive answers for the other objectives of the autopsy tended to be lower.<sup>5,11</sup> For example, Sanner,<sup>11</sup> using the same questionnaire, found that all four objectives scored more than 80%. The mean number of answers was  $3.52 \pm 0.14$  whereas in our study it was  $1.6 \pm 1.15$ . It can be concluded that students at MEDUNSA have a lesser appreciation of the value of autopsy. Unfortunately, this is not unique to students at MEDUNSA. It has been noticed in many other teaching institutions worldwide.<sup>4,5</sup> For example, in New York about 18% of medical and 10% of pathology house staff thought that the autopsy offered little value.<sup>5</sup> Furthermore, 17% of general practitioners do not know that they can request a non-coroner postmortem examination.<sup>14</sup>

In our study, students attended an acceptable number of autopsies. About 67% observed 7 autopsies, but only 6.7%

observed more than 15. However, two-thirds never took part in an autopsy. In her survey in Sweden, Sanner<sup>11</sup> found that 92% of third-year medical students had observed at least 7 autopsies and 50% of them attended more than 15 demonstrations. In some medical schools students graduate without observing a formal autopsy procedure.<sup>1,15</sup> Medical training must encourage students to take part in autopsies, and they should be involved in writing autopsy reports.<sup>16</sup>

It is encouraging that the majority of students considered the first autopsy they attended to be rewarding. The percentage is even higher in other studies.<sup>1,11</sup> This confirms the educational value of the autopsy. However, despite its educational value the autopsy evokes reactions of discomfort in most students. These reactions are aggravated because students are not prepared psychologically for what they see at autopsy.<sup>4,17</sup> When the discomfort reactions are strong, the capacity to appreciate the advantages of autopsy is reduced. Students should therefore be prepared psychologically to avoid autopsy-related emotional shock, and to benefit fully from these procedures.<sup>4,17</sup>

Medical students need to observe and to participate in a minimum number of mandatory autopsies during the pathology course. During their clinical attachments, students should be encouraged to follow up, and to attend the autopsies of patients of theirs who have died. This will not occur, however, if students' teachers are not interested in the procedure. Clinical staff should act as role models in showing a strong interest in the autopsy. It has been shown that high autopsy rates can be maintained by efficient administration, quality control of the autopsy, close interaction with clinicians (including speedy communication of results) and the fostering of a positive attitude among clinicians.<sup>18</sup>

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1. Lowry F. Failure to perform autopsies means some MD's 'walking in a fog of misplaced optimism'. *CMAJ* 1995; **153**: 811-814.
2. Sanner MA. In perspective of the declining autopsy rate: attitudes of the public. *Arch Pathol Lab Med* 1994; **118**: 878-883.
3. Chariot P, Witt K, Pautot V, et al. Declining autopsy rate in a French hospital: physician's attitudes to the autopsy and the use of autopsy material in research publications. *Arch Pathol Lab Med* 2000; **124**: 739-745.
4. Benbow EW. The attitudes of second and third year medical students to the autopsy. *Arch Pathol Lab Med* 1991; **115**: 1171-1176.
5. Wilkes MS, Link N, Jacobs TA, Fortin AH, Felix JC. Attitudes of house officers towards the autopsy. *J Gen Intern Med* 1990; **5**: 122-125.
6. Cartledge PHT, Dawson AT, Stewart JH, Vujanic GM. Value and quality of perinatal and infant postmortem examination. *BMJ* 1995; **310**: 155-158.
7. Byard RW, Bourne AJ. The autopsy: a dying art? A paediatric perspective. *J Paediatr Child Health* 1990; **26**: 119-121.
8. Meier PR, Manchester DK, Shikes RH, Clewell WH, Stewart M. Perinatal autopsy: Its clinical value. *Obstet Gynaecol* 1986; **67**: 349-351.
9. Rushton DI. Should perinatal postmortems be carried out by specialist pathologists? *Br J Obstet Gynaecol* 1995; **102**: 182-185.
10. Goldman L, Sayson R, Robbins S, Cohn LH, Bettman M, Weisberg M. The value of autopsy in three medical eras. *N Engl J Med* 1983; **308**: 1000-1005.



11. Sanner MA. Medical students' attitudes towards autopsy. *Arch Pathol Lab Med* 1995; **119**: 851-858.
12. Muthuphei MN. The value of perinatal autopsy in medical practice. *Pedmed* 1998; **11**(3): 16-18.
13. Cottreau C, McIntyre L, Favara BE. Professional attitudes toward the autopsy: a survey of clinicians and pathologists. *Am J Clin Pathol* 1989; **92**: 673-676
14. Berlin A, Wagstaff R, Bhopal R, Spencer J. Post-mortem examinations: general practitioners' knowledge, behaviour and attitudes. *BMJ* 1994; **308**: 1080-1081.
15. Friederici HHR. Reflections on the postmortem audit. *JAMA* 1988; **260**: 3461-3465.
16. Fernandez-Segoviano P, Lazaro A, Estabau A, Rubio JM, Iruretagoyena JR. Autopsy as quality assurance in the intensive care unit. *Crit Care Med* 1988; **16**: 683-685.
17. Charlton R, Doney SM, Jones DG, Blunt A. Effects of cadaver dissection on the attitudes of medical students. *Med Educ* 1994; **28**: 290-295.
18. Haque AK, Patterson RC, Grafe MR. High autopsy rates at a university medical centre. What has gone right? *Arch Pathol Lab Med* 1996; **120**: 727-732.

## Correlation between erythromycin and azithromycin resistance in *Streptococcus pneumoniae*

**To the Editor:** Erythromycin has long been used as an alternative to penicillin for the treatment of upper and lower respiratory tract infections in children. Modifications of the original chemical structure of erythromycin have produced macrolides such as azithromycin that have improved therapeutic properties. Azithromycin given as a single daily dose for 3 days is used for the treatment of acute group A streptococcal pharyngitis<sup>1</sup> and a meta-analysis of randomised controlled trials found 30 mg/kg of azithromycin, given over 3 - 5 days, to be as effective as longer courses of other antibiotics for the treatment of upper respiratory tract infections.<sup>2</sup> There have, however, been recent reports of macrolide resistance resulting in azithromycin failure for the treatment of group A streptococcal pharyngitis.<sup>3</sup>

In South Africa, azithromycin is frequently prescribed for the treatment of acute otitis media in children; however, the increasing prevalence of erythromycin resistance in *Streptococcus pneumoniae* isolates may adversely affect the efficacy of this therapy. A survey of pneumococci isolated from blood and cerebrospinal fluid (CSF) of children in the public sector of South Africa between 1991 and 1998 found a small but statistically significant increase in resistance to erythromycin, from 1.8% of pneumococci isolated between 1991 and 1994 to 4.2% of pneumococci isolated from 1995 to 1998.<sup>4</sup> In contrast, 39% of pneumococci carried in the nasopharynx of children aged 1 month - 5 years who were sampled prospectively while attending private paediatricians in Johannesburg were resistant to erythromycin.<sup>5</sup>

To evaluate the correlation between resistance to erythromycin and azithromycin, 100 erythromycin-resistant *S. pneumoniae* isolates (minimum inhibitory concentrations MICs) ranged from 1 µg/ml to > 256 µg/ml were tested for concomitant resistance to azithromycin. The isolates had been obtained from middle-ear fluid of children with acute otitis media (N = 34), cases of invasive pneumococcal disease (N = 19), and from the nasopharynx of asymptomatic children (N = 47). MICs were determined by agar dilution (100 isolates) and E-test (98 isolates) using standardised methods and criteria for determination of resistance.<sup>6</sup> The azithromycin powder and methods for susceptibility testing were obtained from the manufacturer. For the pneumococci tested, the MICs for azithromycin correlated with the MICs for erythromycin for

100% of the isolates using both the agar dilution and E-test methods. Therefore, resistance to erythromycin can be used as a surrogate for resistance to azithromycin. Similar results were found in a study of 120 isolates from the USA.<sup>7</sup>

In addition, a study of the impact of azithromycin on carriage of antibiotic-resistant pneumococci found that 5 days of azithromycin treatment resulted in a four-fold increase in the prevalence of erythromycin-resistant pneumococci.<sup>8</sup> These results suggest that in South Africa, where erythromycin-resistant pneumococci are common, macrolide treatment for otitis media infections in children under 4 years of age may have reduced efficacy.

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1. Pfizer Laboratories (Pty) Ltd. Zithromax (azithromycin) package insert. 20 September 1993.
2. Ioannidis JP, Contopoulos-Ioannidis DG, Chew P, Lau J. Meta-analysis of randomized controlled trials on the comparative efficacy and safety of azithromycin against other antibiotics for upper respiratory tract infections. *J Antimicrob Chemother* 2001; **48**: 677-689.
3. Bingen E, Leclercq R, Fitoussi F, et al. Emergence of group A streptococcus strains with different mechanisms of macrolide resistance. *Antimicrob Agents Chemother* 2002; **46**: 1199-1203.
4. Huebner RE, Wasas AD, Klugman KP. Trends in antimicrobial resistance and serotype distribution of blood and cerebrospinal fluid isolates of *Streptococcus pneumoniae* in South Africa, 1991-1998. *Int J Infect Dis* 2000; **4**: 214-218.
5. Huebner RE, Wasas AD, Klugman KP and the Paediatric Study Group. Prevalence of nasopharyngeal antibiotic-resistant pneumococcal carriage in children attending private paediatric practices in Johannesburg. *S Afr Med J* 2000; **90**: 1116-1121.
6. National Committee for Clinical Laboratory Standards. *Performance Standards for Antimicrobial Susceptibility Testing: Twelfth Informational Supplement*. NCCLS document M100-S12. Villanova, Pennsylvania: National Committee for Clinical Laboratory Standards, 2002.
7. Ednie LM, Visalli MA, Jacobs MR, Appelbaum PC. Comparative activities of clarithromycin, erythromycin, and azithromycin against penicillin-susceptible and penicillin-resistant pneumococci. *Antimicrob Agents Chemother* 1996; **40**: 1950-1952.
8. Morita JY, Kahn E, Thompson T, et al. Impact of azithromycin on oropharyngeal carriage of Group A *Streptococcus* and nasopharyngeal carriage of macrolide-resistant *Streptococcus pneumoniae*. *Pediatr Infect Dis J* 2000; **19**: 41-46.