Bacterial Study of Autopsy Specimens

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Autopsy reports were reviewed for the detection of infectious diseases at autopsy and to determine what extent an infectious process was involved in the patient's death. The present study was performed to analyze bacterial data of autopsy specimens in Siriraj Hospital during 1992-1999. Various autopsy specimens were cultured including heart blood, bronchus, lung, brain, cerebro-spinal fluid, pleural fluid, ascitic fluid, peritoneal fluid, liver, kidney, pericardial fluid, spleen and gall bladder. From 781 autopsy specimens 502 (64.28%) were positive for bacterial pathogens. The five most common bacterial pathogens isolated from the present study were nonfermentative gram-negative rods followed by Klebsiella pneumoniae, Salmonella serogroup E, Escerichia coli and Acinetobacter anitratus, respectively. The ante mortem diagnosis by clinicians was correct 56% regarding to retrospectively analysis of septicemia/septic shock versus autopsy culture from heart blood.

Keywords: *Bacteria, Autopsy culture, Autopsy specimens*

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The autopsy has an important role in confirming clinical diagnoses, revealing unexpected findings and determining the cause of death. In the 19th century, autopsy was used in advanced medicine for understanding diseases, the discovery of new diseases and the evaluation of treatment[1]. Several recent reports[2] have emphasized the role of autopsy in monitoring the quality of medical care for hospitalized patients. Published studies[3] of the rate of discrepancy between clinical autopsy findings, for both overall diagnostic accuracy and for specific diagnoses have shown that a substantial number of diagnoses are made only at autopsy. Many patients had infectious diseases, which were not diagnosed before death[4]. Moreover, a study performed at the Christian Medical Collage and Hospital, Vellore, India found that bacterial infection were frequently diagnosed ante-mortem and septicemia was documented in most cases[5]. Previous observations[6] reported that clinical diagnoses remain imperfect, despite advances in diagnostic technology and that the autopsy can continue to play an important role in medical diagnosis. The purpose of the present study was to analyze data of bacterial pathogens isolated from various autopsy specimens.

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Material and Method

Clinical specimens were cultured for aerobic/facultative pathogenic bacteria on blood agar, MacConkey agar and chocolate agar. Plates were incubated in 5% CO_2 at 35°C for 2-5 days. Bacterial pathogens were isolated and identified according to standard microbiological technique[7].

Results

Data from 781 autopsy specimens were analyzed at Siriraj Hospital during 1992-1999. Five hundred and two cases were positive for bacterial pathogens (64.28%). The number and different sources of autopsy specimens isolated was shown in Table 1. The positive rates of bacterial pathogens were as follows i.e., heart blood (54.5%), bronchus (88.5%), lung (82.9%), brain (65.9%), liver (85.7%), kidney (91.3%), spleen (100%), gall bladder (100%), cerebrospinal fluid (61.1%) and pericardial fluid (57.1%). Additionally, the six most common bacteria isolated were nonfermentative gram-negative rods (111 strains), *Klebsiella pneumoniae* (98 strains), *Pseudomonas aeruginosa* (82 strains), *Escherichia coli* (72 strains),

Acinetobacter anitratus (64 strains) and *Staphylococcus aureus* (59 strains). Some other interesting bacteria were also cultured to a lesser extent i.e., *Salmonella* group B and E (2 strains each), *Burkholderia pseudomalllei* (2 strains), *Nocardia* species (1 strain) and *Enterococcus* species (39 strains), *Candida* species (35 strains) and *Cryptococcus neoformans* (1 strain) were also isolated (Table 2).

For heart blood and lung; nonfermentative gram-negative rods ranked first, followed by *K. pneumoniae*. For CSF, brain and bronchus *K. pneumoniae* ranked first, followed by *P. aeruginosa* or other nonfermentative gram-negative rods. The ante mortem diagnosis by clinicians was correct 56% regarding to retrospectively analysis of septicemia/ septic shock versus autopsy culture from heart blood.

Discussion

The present study analyzed bacterial pathogens isolated from autopsy specimens, confirming previously published observation[7]. In the study in India[8], it was reported that infectious diseases were the most common cause of death (46.8%), followed by cardiovascular diseases (17.1%) and neoplastic

Table 1. Number of various specimens with positive bacterial pathogens

	heart blood	bronchus	lung	brain	CSF	pleural fluid	ascitic fluid	peritoneal fluid	liver	kidney	pericardial fluid	spleen	gall bladder	Total
No. of specimens	396	26	170	41	18	25	33	16	14	23	14	3	2	781
No. of specimens with positive bacterial pathogen	216	23	141	27	11	11	19	8	12	21	8	3	2	502
%	54.5	88.5	82.9	65.9	61.1	44	57.6	50	85.7	91.3	57.1	100	100	64.28

Table 2. Type and number of bacterial pathogens isolated from autopsy specimens

Bacterial pathogens	heart blood	bronchus	lung	pleural fluid	brain	CSF	ascitic fluid	peritoneal fluid	liver	spleen	gall bladder	kidney	pericardial fluid	Total
E. coli	34	1	14	2	5	1	5	-	1	2	1	5	1	72
K. pneumoniae	40	7	30	2	9	3	1	1	1	-	1	3	-	98
Enterobacter species	19	2	11	-	3	1	1	-	1	-	1	1	1	41
Proteus species	4	1	1	-	1	-	-	1	-	-	-	-	-	8
C. freundii	1	-	1	-	-	-	-	-	-	-	-	-	-	2
Salmonella group B	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Salmonella group E	31	3	29	2	6	2	1	-	2	-	-	4	2	82
N.F.	43	3	32	4	6	2	7	2	2	1	-	6	3	111
A. anitratus	26	2	23	1	2	1	5	-	2	1	-	1	-	64
B. pseudomallei	-	-	1	-	-	-	-	-	1	-	-	-	-	2
H. influenzae	-	1	-	-	-	-	-	-	-	-	-	-	-	1
P. aeruginosa	1	-	-	-	-	1	-	-	-	-	-	-	-	2
S. aureus	23	6	18	3	2	1	1	1	-	-	-	2	2	59
Group D non enterococci	1	-	1	-	-	-	-	-	-	-	-	-	-	2
Enterococcus species	21	1	7	-	3	-	1	2	3	-	-	1	-	39
β-hemolytic streptococci not group A, B, D	1	-	1	-	1	-	-	1	-	-	-	-	-	4
Viridans streptococci	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Streptococcus pneumoniae	1	-	1	-	-	-	-	-	-	-	-	-	-	2
Coagulase-negative staphylococci	4	-	-	-	-	-	-	-	-	-	-	-	-	4
Nocardia spcies	-	-	-	-	-	-	-	-	1	-	-	-	-	1
C. neoformans	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Candida species	18	3	8	-	-	-	3	1	-	-	-	2	-	35
Total	271	30	179	14	38	12	25	9	14	4	3	25	9	633

diseases (14.3%). In developing country, low socio-economic status, malnutrition and lack of health awareness may be responsible for the high incidence of infectious diseases. Moreover, in 1996 autopsy material from 72 patients with hematological malignancies treated in India was reviewed[9]. Thirty seven patients (51%) had documented infections, 27% had bacterial infections, 14 of which were gram-negative bacilli, with *Pseudomonas* species identified in 50% of these cases, followed by *E.coli* and *Klebsiella* species, respectively. Similarly, the present study showed that nonfermentative gram-negative rods were the most bacterial pathogens isolated followed by *K. pneumoniae*, *P. aeruginosa*, *E. coli*, *A. anitratus*, respectively. Thus, the authors can conclude that gram-negative rods were the most frequently isolated bacteria compared to gram-negative cocci and non-fermentative gram-negative rods, *K. pneumoniae* and *P. aeruginosa* were important. Interestingly, the present study also showed that septicemia was documented in 102 cases and was most often due to *K. pneumoniae*. Similar to previous study in India which showed that septicemia was the most frequently diagnosed[10]. However, *P. aeruginosa* was the most etiologic agent.

In the present study the authors used sterile technique according to standard microbiological basis for culture all autopsy specimens. Sterile technique was also applied at Department of Pathology by pathologists to perform autopsy and allocate various specimens. In addition, the timing was concise. The bacterial contamination (if any) should be limited to the small extent. The detail for timing was as follows: (a) Within 2 hours after the patient's death, the body was refrigerated at Department of Pathology. (b) Within the same day or latest the next morning, autopsy was performed by pathologist. This took approximately 3 hours. (c) The autopsy specimens were immediately sent to Bacteriology Laboratory, Department of Microbiology for culture and identification of pathogenic bacteria. (d) The laboratory technicians who were on duty in Bacteriology Laboratory which was opened for service 24 hours, performed direct smear and gram stain of autopsy specimens including culture on primary plating media (blood agar, chocolate agar and MacConkey agar).

Modern technology has not improved the overall accuracy of clinical diagnoses. The routine culture of autopsy specimens may reveal major unexpected finding that are of clinical importance and that continued emphasis on autopsy evaluation is necessary for the improvement of diagnosis, treatment and prevention of infectious diseases. The present study may provide useful information concerning infectious diseases among patients undergoing autopsy.

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การศึกษาด้านแบคทีเรียวิทยาของสิ่งส่งตรวจจากศพ

สมพร ศรีเฟื่องฟุ้ง, ชาญวิทย์ ตรีพุทธรัตน์, ธิติยา ยั่งยืน

รายงานนี้เป็นการศึกษาข้อมูลการตรวจหาเชื้อแบคทีเรียก่อโรคซึ่งเป็นสาเหตุการเสียชีวิตของผู้ป่วยซึ่งเข้ารับการรักษาในโรงพยาบาลศิริราช โดยมีระยะเวลาระหว่าง พ.ศ. 2535-2542 รวมทั้งสิ้น 8 ปี สิ่งส่งตรวจที่เก็บได้จากศพของผู้ป่วยมีหลายชนิด คือ เลือดจากหัวใจ หลอดลม ชิ้นเนื้อจากปอด ชิ้นเนื้อจากสมอง น้ำไขสันหลัง น้ำจากช่องเยื่อหุ้มปอด น้ำเจาะจากช่องท้อง ชิ้นเนื้อจากตับ ชิ้นเนื้อจากไต น้ำในช่องเยื่อหุ้มหัวใจ ม้าม ถุงน้ำดี รวมทั้งสิ้น 781 ราย พบว่ามีเพียง 502 ราย คิดเป็นร้อยละ 64.28 เท่านั้นที่สามารถแยกเชื้อแบคทีเรียได้ และแบคทีเรียที่พบได้บ่อยที่สุด 5 อันดับแรกคือ Nonfermentative gram-negative rods รองลงมาคือ Klebsiella pneumoniae, Salmonella group E, Escherichia coli และ Acinetobacter anitratus ตามลำดับ การวินิจฉัยโรคติดเชื้อแบคทีเรียที่เป็นสาเหตุของการเสียชีวิตของผู้ป่วยโดยแพทย์ผู้ทำการรักษามีความถูกต้องร้อยละ 56 โดยการวิเคราะห์ข้อมูลของผู้ป่วยที่ได้รับการวินิจฉัยก่อนเสียชีวิตว่าเป็นเซฟติซีเมีย/เซฟติช็อก และความสัมพันธ์กับผลการเพาะหาเชื้อแบคทีเรียก่อโรคของเลือดจากหัวใจ