

PSEUDOMONAS AERUGINOSA WOUND INFECTIONS IN TRAUMATIC PATIENTS

A. Boshnakova, D. Boshnakov

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Recently, the relative part of posttraumatic infections rises considerably. This is a consequence of an increased traumatism and modern hospitalism (5, 9). There are also changes of microbial flora. The infections caused by Gram-negative bacteria of the family Enterobacteriaceae (2, 3) rise, indeed. This fact is due to the frequent administration of broad-spectrum antibiotics and to their action on microbial flora. That results in the replacement of a series of «classical» etiological agents by more resistant hospital strains. *Pseudomonas aeruginosa* (PA) occupies a considerable part among Gram-negative etiological factors for surgical infections in the traumatologic departments (1, 4, 6—9).

The purpose of our study was to analyse the degree of isolation of PA from different suppurative processes with traumatological patients as well as the resistance of its strains to various antibiotics and chemotherapeutics used.

Material and methods

Our analysis covered an one-year period (1985). A total of 151 patients hospitalized in the Clinic of Orthopedics and Traumatology of the Higher Institute of Medicine, Varna were examined. They had various injuries and posttraumatic states: different kinds of wounds, open fractures, contusions, osteomyelitis, etc. The isolation and identification of the PA strains was carried out after the routine methods for diagnosis of Gram-negative bacteria. We determined the resistance to antibiotics after the modified method of Bauer—Girby.

Results and discussion

A total of 25 materials studied (16.6 per cent) out of 151 ones were sterile. From the rest 126 ones, a total of 40 PA strains were isolated (26.5 per cent). In a similar investigation in 1979 we reported that PA share was 16.1 per cent. According to Z. Zlatanov (2, 3) this microorganism was isolated in 6.3 per cent of the cases, according to Sheina — in 27 per cent, Kolker — up to 30.8 per cent but with superinfections up to 62 per cent of the cases (cited after 3).

Our data were demonstrated on table 1.

PA was proved in monoculture with 26 (65 per cent) of the cases. PA strains' distribution in the monoculture was shown on table 2. In 14 cases (35 per cent) PA was associated with different representatives of the family Enterobacteriaceae. These associations were presented on table 3.

In 5 cases (37.5 per cent) with preliminarily proved different microflora (*E. coli*, *Citrobacter*, *Klebsiella*, *Enterobacter*) PA was isolated after a prolonged patient's hospitalization.

Table 1

Results from the bacterial study

Patients n	Sterile cultures		Contaminated cultures — 126 (83.4 %)			
			totally isolated PA		other microorganisms	
	n	%	n	%	n	%
151	25	16.6	40	26.5	86	56.9

Table 2

Distribution of PA strains in monoculture

Isolated n	strains %	PA in monoculture		Primary isolation			
				preoperative period		postoperative period	
		n	%	n	%	n	%
40	26,5	26	65	20	50	6	15

Table 3

Associations between PA and other strains

Isolated strains		PA associations with							
		total		Proteus		Klebsiella Enterobacter		E. coli Citrobacter	
n	%	n	%	n	%	n	%	n	%
40	26.5	14	35	9	64.3	3	21.4	2	14.3

The table 4 illustrated the resistance of 40 PA strains to some antibiotics and chemotherapeutics. It was evident that PA has completely consumed its sensitivity to Penicillin, Ampicillin, Oxacillin, Lincomycin, Colistin and Cefatrexil. Only 4 PA strains (10 per cent) were strongly sensitive to Carbenicillin while 2 ones (5 per cent) were sensitive to Chloramphenicol, 9 ones (22,5 per cent) — to Gentamycin, 3 ones (7.5 per cent) — to Novobiocin, and 3 ones (7.5 per cent) — to Gramurin. PA strains showed the highest percentage of sensitivity to Amikin — 33 ones (82,5 per cent) followed by that to Brulamycin — 19 ones (47.5 per cent), 5-Nitrox — 17 ones (42.5 per cent), Erythromycin — 16 (40 per cent), and Nelidix — 10 (25 per cent). Four strains showed complete resistance to the antibiotics used.

PA is one of the frequent causative agent of wound infections. Its high natural survival rate, marked adaptation ability, complete or partial resistance to chemotherapeutics helps its broad dissemination in hospitals.

PA isolation in monocultures with 26 (65 per cent) cultures confirms once more the opinion concerning its high adaptability and antagonistic activity. That is why it replaces the other microbial flora representatives from the wounds infected and then it continuously vegetates there as a monoculture species. PA establishment in combination with other microorganisms, especially with representatives of the family Enterobacteriaceae was observed in patients with pro-

Table 4
Sensitivity of 40 PA strains to antibiotics and chemotherapeutics

Antibiotics and chemotherapeutics	strongly sensitive	moderately sensitive	resistant
Penicillin	—	—	100 %
Ampicillin	—	—	100 %
Oxacillin	—	—	100 %
Carbenicillin	10.0 %	2.5 %	87.5 %
Kanamycin	—	5.0 %	95.0 %
Tetracyclin	—	—	100 %
Chloramphenicol	5.0 %	5.0 %	90.0 %
Bisepitol	2.5 %	2.5 %	95.0 %
Streptomycin	12.5 %	—	87.5 %
Erythromycin	40.0 %	2.5 %	57.5 %
Gentamycin	22.5 %	—	77.5 %
Colistin	—	—	100 %
5-Nitrox	42.5 %	—	57.5 %
Amikin	82.5 %	2.5 %	15.0 %
Gramurin	7.5 %	2.5 %	90.0 %
Brulamycin	47.5 %	—	52.5 %
Lincomycin	—	—	100 %
Cefatrexil	—	—	100 %
Novobiocin	7.5 %	5.0 %	87.5 %
Nelidix	25.0 %	—	75.0 %

found injuries, open fractures and severe contusions. The mixed microbial flora determined a more abundant suppuration hardly effected by the antibiotic therapy. Secondary wound infection prolonged significantly the healing process.

It is stressing that PA shows a high percentage of resistance to most antibacterial preparations used (Ampicillin, Oxacillin, Streptomycin, Penicillin, Chloramphenicol, Kanamycin) — over 80 per cent. Aminoglycosides are preferred but concerning Gentamycin strains' resistance is more than 70 per cent. In our Clinic of Orthopedics and Traumatology we administer as antibiotics of choice in cases of PA infection Amikin, Brulamycin, 5-Nitrox, and Erythromycin.

We can make the following conclusions:

1. PA ascertaining, especially in association with enteric bacteria worsens and prolongs considerably the healing process.
2. PA shows a high resistance to «routinely» used antibiotics nowadays.
3. Amikin should be administered predominantly as a therapeutic means when infections caused by resistant hospital PA strains are concerned.

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РАНЕВЫЕ ИНФЕКЦИИ ЭТИОЛОГИЧЕСКИМ АГЕНТОМ PSEUDOMONAS AERUGINOSA У ТРАВМАТИЧЕСКИ БОЛЬНЫХ

А. Бошнакова, Д. Бошнаков

Р Е З Ю М Е

Проведен анализ раневых секретов 151 травматически больного. Анализ сделан с целью проследить изолируемость *Pseudomonas aeruginosa* и определить его роль в различных воспалительных процессах, а также определить чувствительность штаммов к различным антибиотикам и химиотерапевтикам.

Из исследованного 151 материала 25 (16,6 %) остались стерильными. В остальных материалах изолировано 40 (26,5 %) штаммов *Pseudomonas aeruginosa*, из которых 26 (65 %) в монокультуре и 14 (35 %) в ассоциации с другими бактериями сем. Enterobacteriaceae.

Результаты антибиограмм показывают, что *Pseudomonas aeruginosa* вполне исчерпил свою чувствительность к Penicillin, Ampicillin, Oxacillin, Cefalrexil. Четыре из штаммов остались резистентными. Сильно выраженная чувствительность была проявлена к Amikacin-33 (82,5 %), Brulamycin — 19, (47,6 %), 5-Nitrox-17 (42,5 %), Erythromycin — 16 (40 %), Nelidix — 10 (25 %).