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Bacteriology of Peritonitis in Children Treated at the University Hospital of Marrakech

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Abstract: Child peritonitis are severe intra-abdominal infections, involving vital prognosis. The available microbiological data of peritonitis in children are inadequate, and antibiotic therapy is not consensual. Description of the bacteriological profile and the antibiotic resistance of the isolated bacteria in the various samples of peritoneal fluid from the different departments of the University Hospital of Marrakech. It is a descriptive study spread over two years. carried out at the Laboratory of Microbiology of the Mohamed VI Hospital of Marrakech (CHU MED VI), covering all the bacterial strains, isolated in the peritoneal fluid samples from the various pediatric departments of the University Hospital. During this period, 92 samples were treated in the laboratory with a positivity rate of 80%. The average age of his children is 11.7 years with a sex ratio of 1.4. The infection was polymicrobial in 40%. Escherichia. coli dominated the bacteriological profile of these peritonitis in 74% of cases, followed by Streptococcus spp (30%), Pseudomonas aeruginosa (18%), Enterobacter cloacae (6%) and Klebsiella pneumoniae (1%). The susceptibility to amoxicillin in enterobacteria isolated from peritonitis was 32%, 68% for amoxicillin/clavulanic acid, 92% for 3rd generation cephalosporins, 97% for fluoroquinolones, 67% for cotrimoxazole and 89% for gentamycin. Only one strain of Pseudomonas aeruginosa was resistant to ceftazidime. All strains remained sensitive to amikacin and carbapenems. Resistance of Enterobacteria to 3rd generation cephalosporins by the production of Extended Spectrum Betalactamase (ESBL) in the isolates was 4%. This prompts us to reconsider our therapeutic approach. We believe that the association C3G + aminoglycoside + metronidazole should be used first-line in severe pediatric peritonitis in our context. The quick initiation of an antibiotic therapy adapted to the resistance profile would be an important factor in improving the prognosis, hence the interest of close collaboration between surgeons, anesthesiologist-intensive care and microbiologists.

Keywords: Peritonitis, Antibiotherapy, Pediatrics

1. Introduction

Child peritonitis are severe intra-abdominal infections, involving vital prognosis. They require both a surgical gesture with emergency antibiotic therapy. This antibiotherapy precedes and completes the surgical procedure, with the aim of controlling bacteremia and the spread of infection [1]. Epidemiological and microbiological data available on community peritonitis of the child are insufficient, and antibiotic therapy does not still the subject of a consensus. On the other hand, in adults, the antibiotic therapy of these intra-abdominal infections was the subject of a French consensus conference recommending the use of amoxicillin-clavulanic acid and aminoglycoside [2]. In the context of emergence of resistant bacterial strains, iterative epidemiological studies are necessary to follow the evolution

of the resistance of the etiological agents involved in this pathology and to propose adequate therapies [3]. Thus we conducted this work to study the microbiological profile of community peritonitis of the child in our region, to discuss their probabilistic antibiotherapy.

2. Materials and Methods

2.1. Type of Study

This is a retrospective study carried out at the Laboratory of Microbiology of the Mohamed VI Hospital of Marrakech (CHU MED VI), covering all the bacterial strains, isolated in the peritoneal fluid samples from the various pediatric departments of the University Hospital.

The study was conducted over a 24-month period from January 1, 2017 to December 31, 2018.

2.2. Inclusion Criteria

Included in the study, all children hospitalized at the University Hospital of Marrakech who have made a peritoneal sample on an intra-abdominal collection or an echo or scanno-guided puncture of the peritoneal fluid in a postoperative context.

2.3. Sampling and Patient

The study focused on peritoneal fluid samples sent for cytobacteriological examination. For each sample received, a quantitative and qualitative cytology was performed with a direct Gram-stained examination to check for the presence of any bacteria. The cultivation of the sampling was done systematically on enriched and selective media.

2.4. Bacterial Identification and Antibiogram

Bacterial identification of positive cultures was carried out by conventional methods based on morphological and biochemical characters. The study of susceptibility to different antibiotics was made according to the recommendations of the Committee of the antibiogram of the French society of microbiology CASFM - EUCAST.

An operating chart was used to record the age, sex, clinical, microbiological and evolutionary data of patients.

3. Results

During this period, 92 samples were processed in the laboratory. The average age of the children is 11.7 years with a sex ratio M / F of 1.4. Four patients were admitted to severe sepsis. The positivity rate was 80% (n = 74) with an isolation of 106 bacterial strains. The infection was poly-microbial in 40% (Table 1).

Table 1. *Distribution of peritonitis according to the number of isolated germs.*

Culture	Nomber	Frequency (%)
Sterile	18	19
Monomicrobial	37	40
Bimicrobial	31	33
Trimicrobial	6	6
Total	92	100

The bacteriological profile of this peritonitis was dominated by *enterobacteria* with *E. coli* in 52% followed by *Streptococci* in 21%, and *Pseudomonas aeruginosa* in 13% (Table 2).

Table 2. *Distribution according to the isolated bacterial species.*

	Family	Germ	Nomber	Frequency
GRAM NEGATIVE BACILLUS	*ENTEROBACTERIA*	*Escherichia coli*	56	52
		Klebsiella pneumoniae	1	1
		Enterobacter cloacae	5	4
		Citrobacter freundii	2	2
		Salmonella Enterica	1	1
		Shigella boydii	1	1
	PSEUDOMONADACEAE	*Pseudomonas aeruginosa*	14	13
GRAM POSITIVE COCCI	*STREPTOCOCCUS*	*Streptocoque spp*	23	21
		Enterocoque spp	1	1
	STAPHYLOCOCCUS	*aureus*	2	2
TOTALE			106	100

The germ associations were represented mainly by *Escherichia coli* and *Streptococcus* in 18% of cases.

Escherichia. coli was 32% sensitive to amoxicillin, 68% to amoxicillin-clavulanic acid, 92% to ceftriaxone and 97% to fluoroquinolones. All strains remained sensitive to amikacin and imipenem (Figure 1).

Resistance of *Enterobacteria* to 3rd generation cephalosporins by the production of Extended Spectrum Betalactamase (ESBL) in the isolates was 4%.

All isolates of *streptococci* and *staphylococci* were sensitive to penicillins and meticillin, respectively.

All isolated *Pseudomonas* strains were sensitive to imipenem, fluoroquinolones and gentamicin, and only one was resistant to ceftazidime.

Probabilistic antibiotic therapy initially administered was the combination of amoxicillin-clavulanic acid in addition to gentamicin, except for patients with severe sepsis, who received a triple combination: ceftriaxone + gentamycin + metronidazole. An adaptation of the antibiotherapy was systematically made after the results of the microbiological analysis.

4. Discussion

Bacterial peritonitis is associated in developing countries

with a high risk of mortality. An effective microbiological diagnosis followed by appropriate antibiotic therapy improves the results of the treatment [4].

The microbiology of peritonitis is derived from the intestinal flora [5]. Several studies have confirmed the microbial polymorphism in peritonitis but a pathogenic role is proved for a small number [6].

E. coli is the most common germ, so the consensus of the French Society of anesthesia resuscitation recommends to take into account, during the probabilistic antibiotherapy of community peritonitis, *enterobacteria* [2].

The French Consensus Conference of 2000 recommended associating amoxicillin-clavulanic acid with an aminoglycoside [2].

In our context, the evolution of the resistance of *Enterobacteria*, responsible for peritonitis in children, to amoxicillin-clavulanic acid increased between 2006 to 2010 from 16% to 36% and it decreased in 2018 to 32% (figure 2).

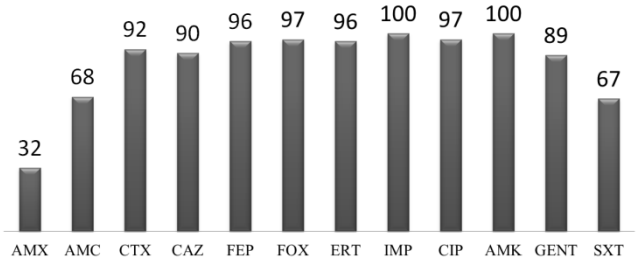

Figure 1. *Percentage of susceptibility of Escherichia. coli to antibiotics.*

AMX: amoxicillin; AMC: amoxicillin-clavulanic acid; CTX: ceftriaxone; CAZ: ceftazidime; FEP: cefepime; FOX: cefoxitin, CIP: ciprofloxacin; ERT: ertapenem; IMP: imipenem; GENT: gentamicin; AMK: amikacin; SXT: sulfamethoxazole – trimethoprim.

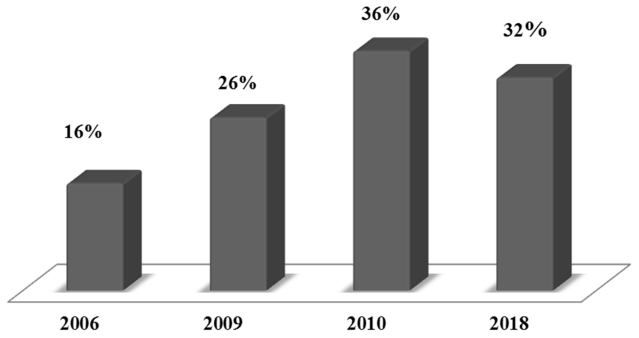

Figure 2. *Evolution of resistance of enterobacteria to amoxicillin-clavulanic acid at the University Hospital of Marrakech.*

The sensitivity of *enterobacteria* to the amoxicillin-clavulanic acid combination in our study is reduced (68%) compared to a recently published French study (90.3%) [7, 8]. This rate was 87% in another French study [9] and 81% in a Scandinavian study [10] (Figure 3).

Several studies show an inconsistent action on Gram-negative bacteria and a resistance of more than 30% of Escherichia coli to clavulanic acid due to the secretion of the enzyme b-lactamase TEM-1 which is not inhibited by this molecule and by the hypersecretion of penicillinases [11].

The percentage of *Enterobacteria* resistance to 3rd generation cephalosporins in our series increased slightly between 2010 and 2018, from 7% to 9%.

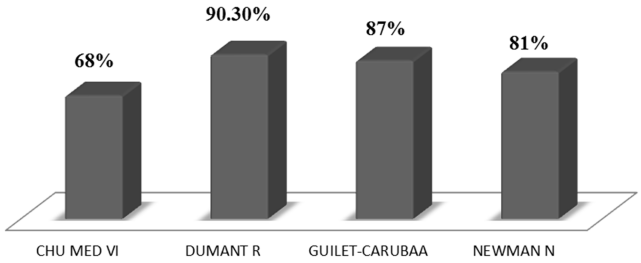

Figure 3. *Percentage sensitivity of enterobacteria to amoxicillin-clavulanic acid from other teams.*

Globally, the SMART study showed that E. coli is a producer of ESBL in 18% of cases in 2006-2007, compared to 12% of cases in 2005. An important difference between regions was found: the highest frequency of ESBL was in Asia (34.9%), followed by Latin America (21.6%), Africa and the Middle East (12.1%), Europe (8%) and North America (4.8%) [12].

The high rate of *Pseudomonas* in our study can be attributed to repeated antibiotic therapy including self-medication in our context. Although Pseudomonas was not considered in probabilistic antibiotic therapy, the microbiological results made it possible to include active antibiotics on these germs [13, 18].

To treat these infections, antibiotic therapy must be early, with a suitable dosage and covering the bacterial ecology. In view of our findings, a triple combination of ceftriaxone, metronidazole and gentamicin effectively covers *E. coli* and anaerobes [14, 19].

But the appearance of resistant strains by the production of ESBL allowed us to reserve this protocol for severe forms of peritonitis, and using amoxicillin-clavulanic acid and gentamicin for simple forms. A monotherapy based on ertapenem is also effective. The piperacillin-tazobactam combination may also be proposed, but it was not systematically studied in our series [15, 17].

The use of other antimicrobials as imipenem, cefepime, aztreonam and tigecycline should be limited to prevent the emergence of multiresistant strains [6].

5. Conclusion

In light of these data and taking into account the potential gravity of community peritonitis in children, we choose in our context for a triple combination of cefriaxone, metronidazole and gentamicin in severe forms. Special interest must also be paid to reduce the inappropriate use of antimicrobials and to ban self-medication [16]. Further prospective studies should be conducted to follow the evolution of the bacteriological profile of the germs responsible for the peritonitis of the child and to guide probabilistic antibiotherapy.

Declaration of Interests

The authors declare no conflicts of interest related to this article.

References

[1] Bourgoin A, Leone M, Marti C. Prise en charge thérapeutique des péritonites. Med Mal Infect 2004; 34: 183-95.

[2] Société Française d'Anesthésie-Réanimation. Prise en charge des péritonites communautaires - conférence de consensus - texte court. Ann Fr Anesth Reanim 2001; 20: 368s-73s.

[3] Nejmi H, Laghla B, Boutbaoucht M, Samkaoui MA. Evolution des résistances de l'Escherichia coli au cours des péritonites communautaires. Med Mal Infect 2011; 41: 213-20.

[4] Mahamoudou Sanou, Armand Ky, Caractérisation de la flore bactérienne des péritonites communautaires opérées au Burkina Faso; The Pan African Medical Journal. 2014; 18: 17.

[5] Leone M, Boyadjiev I, Martin C. Péritonites communautaires: quelle antibiothérapie probabiliste? Urg Prat 2007; 80: 31-4.

[6] J. B. Dever, M. Y. Sheikh. Spontaneous bacterial peritonitis – bacteriology, diagnosis, treatment, risk factors and prevention. Alimentary pharmacology and therapeutics; volume 41, Issue11, June 2015; 1116-1131.

[7] Montravers P, Lepape A, Dubreuil L, Gauzit R, Pean Y, Benchimol D, Dupont H. Clinical and microbiological profiles of community-acquired and nosocomial intra-abdominal infections: results of the French prospective, observational EBIIA study. J Antimicrob Chemother 2009; 63: 785-94.

[8] Montravers P, Jean-Baptiste S, Tashk P, Péritonites. Le Congrès. Médecins. Conférence d'Essentiel, 2016.

[9] Dumont R, Cinotti R, Lejus C, Caillon J, Boutoille D, Roquilly A, et al. The microbiology of community-acquired peritonitis in children. Pediatr Infect Dis, J 2011; 30: 131–5.

[10] Newman N, Wattad E, Greenberg D, Peled N, Cohen Z, Leibovitz E. Community acquired complicated Intra abdominal infections in children hospitalized during 1995–2004 at a paediatric surgery department. Scand J Infect Dis 2009; 41: 720–6.

[11] Soussy CJ. Comité de l'antibiogramme de la société française de microbiologie. Communiqué 2010 - 2011. Path Biol. 2010; 48: 832-71. PubMed | Google Scholar.

[12] Hawser SP, Bouchillon SK, Hoban DJ, Badal RE. In vitro susceptibilities of aerobic and facultative anaerobic Gram negative bacilli from patients with intra-abdominal infections worldwide from 2005–2007: results from the SMART study. Int J Antimicrob Agents 2009; 34: 585–8.

[13] Profil bactériologique des péritonites communautaires de l'enfant prises en charge au CHU de Marrakech 2012 Published by Elsevier Masson SAS on behalf of the Société francaise d'anesthésie et de réanimation (Sfar).

[14] Nadler EP, Gaines BA, Therapeutic Agents Committee of the Surgical Infection Society. The Surgical Infection Society guidelines on antimicrobial therapy for children with appendicitis. Surg Infect (Larchmt) 2008; 9: 75–83.

[15] Rodrıguez-Ban o J, Navarro MD. Extended-spectrum beta-lactamases in ambulatory care: a clinical perspective. Clin Microbiol Infect 2008; 14 (Suppl. 1): 104–10.

[16] Kilian Friedrich, Simone Nüssle, Tobias Rehlen. Microbiology and resistance in first episodes of spontaneous bacterial peritonitis: implications for management and prognosis, Journal of gastroenterology and hepatology; volume31, Issue6, June 2016 Pages 1191-1195.

[17] W. Zhang, Y. Wu, X. Qi, H. Dai, W. Lu and M. Zhao, "Peritoneal Dialysis-Related Peritonitis with Acinetobacter baumannii: A Review of Seven Cases", Peritoneal Dialysis International, vol. 34, no. 3, pp. 317-321, 2013.

[18] Sartelli M. A focus on intra-abdominal infections. World J Emerg Surg 2010; 5: 2–20.

[19] Ji Young Jang, Seung Hwan Lee, Epidemiology and Microbiology of Secondary Peritonitis Caused by Viscus Perforation: A Single-Center Retrospective Study Surgical Infections; Vol. 16, No. 4; Published Online: 24 Jul 2015.