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Brief Article

Early clinical assessment of pneumonia and bronchopneumonia treatment in a Cardiovascular Intensive Care Unit

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Acronyms
ENP: early NP
ICU: Intensive Care Units
IMV: invasive mechanical ventilation
NP: nosocomial pneumonia
SNP: severe NP

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ABSTRACT

Introduction: Nosocomial infections are common. Nosocomial pneumonia is the second most common among these infections and is the first in the Intensive Care Unit, where it reaches an incidence of 10-20%.

Objective: To determine the effect of progressive clinical assessment from 48-72 hours of initiation of antimicrobial therapy.

Method: A descriptive, prospective, cross-sectional research was performed in 57 patients (incidental sampling) diagnosed with painful ischemic heart disease who developed nosocomial pneumonia or bronchopneumonia and were admitted at the Cardiovascular Intensive Care Unit of Dr. Celestino Hernández Robau hospital, from January 3 to December 31, 2013.

Results: The initial clinical categorization favored the diagnosis of 50 early pneumonia and bronchopneumonia and 7 serious ones. Progressive assessment from 48-72 hours identified the unsatisfactory evolution in 6 (12%) of the early nosocomial pneumonia and in 4 (57.1%) of the serious ones.

Conclusions: The early progressive clinical assessment is useful for detecting response to antimicrobial treatment of nosocomial pneumonia and act accordingly.

Key words: Pneumonia, Hospital infection, Anti-bacterial agents, Intensive Care, Hospital costs

Evaluación clínica temprana del tratamiento de neumonías y bronconeumonías en Terapia Intensiva Cardiovascular

RESUMEN

Introducción: Las infecciones nosocomiales son frecuentes. La neumonía nosocomial es la segunda más común entre este tipo de infecciones y es la primera en la Unidad de Terapia Intensiva, donde alcanza una incidencia de 10 a 20 %.

Objetivo: Determinar el efecto de la evaluación clínica evolutiva desde 48 - 72 horas de iniciado el tratamiento antimicrobiano.

Método: Se realizó una investigación descriptiva, prospectiva de corte longitudinal,

en 57 pacientes (muestreo incidental) con diagnóstico de cardiopatía isquémica dolorosa, que desarrollaron neumonía o bronconeumonía nosocomial e ingresaron en la Unidad de Terapia Intensiva Cardiovascular del hospital "Dr. Celestino Hernández Robau", desde el 3 de enero al 31 de diciembre de 2013.

Resultados: La categorización clínica inicial favoreció el diagnóstico de 50 neumonías y bronconeumonías precoces y 7 graves. La evaluación evolutiva desde las 48 - 72 horas identificó la evolución no satisfactoria en 6 (12 %) de las neumonías nosocomiales precoces y en 4 (57,1 %) de las graves.

Conclusiones: La evaluación clínica evolutiva temprana es útil para detectar la respuesta al tratamiento antimicrobiano de las neumonías nosocomiales y actuar en consecuencia.

Palabras clave: Neumonía, Infección hospitalaria, Antibacterianos, Cuidados intensivos, Costos de hospital

INTRODUCTION

Nosocomial infections account for 5 to 10% of all sepsis in a hospital[1]. Nosocomial pneumonia or bronchopneumonia (NP) —infection that appears 48 hours after hospital admission and is not incubated at the time of admission— is the second most common among these infections in general wards and the first in the Intensive Care Units (ICU) worldwide, where it reaches an incidence of 10-20%[1,2]. Its lethality is doubled in patients with invasive mechanical ventilation (IMV) and mortality rate is over 50%[1-3].

After initiating antimicrobial therapy, most patients with moderate or severe infections will have a clinical course characterized by three periods. The first period is a clinically unstable phase where the intravenous antimicrobial treatment is started (it typically lasts 48 to 72 hours); the second, after the patient reaches a point of clinical stability, is a period where the early clinical improvement begins, and a tendency to normalization of signs, symptoms and laboratory data is noticed; and the third period is when the final clinical improvement occurs because the patient has been cured of the infectious process[4-7].

Early empirical treatment with broad-spectrum antibiotics is the correct first step to reduce mortality. However, this therapeutic potential may expose the patient to overdose of antimicrobial drugs and the nonrational use of medications. That is why, in 2001, Niederman *et al*[8] noted the importance of progressive clinical assessment of pneumonia and acute bronchopneumonia in adults, nosocomial or community-acquired, from 48-72 hours, and proposed bases for its application. This is a strategy to address the inappropriate use of antimicrobial drugs, which reaches alarming figures of up to 65% in hospitals[4].

The objective of this study was to determine the effect of progressive clinical assessment from 48-72 hours after starting antimicrobial treatment.

METHOD

A descriptive, longitudinal, prospective study was conducted in 57 patients with a diagnosis of painful coronary artery disease who had developed nosocomial pneumonia or bronchopneumonia and were admitted to the Cardiovascular ICU of the Celestino Hernández Robau Hospital, from January 3 to December 31, 2013.

The population consisted of all patients admitted to the above mentioned cardiovascular ICU. The sample was obtained by incidental sampling for those who met the inclusion criteria. Fifty patients who had early NP (ENP) and 7 with severe NP (SNP) were selected.

Diagnostic criteria

Diagnostic criteria for NP were established by Waldemar *et al*[10]:

1. Purulent tracheobronchial secretions
2. Fever
3. Leukocytosis
4. New or progressive infiltrates on chest radiograph, 48 hours after being admitted to hospital or having started IMV in a healthcare unit

Classification

The NP were classified based on the length of hospital stay and the presence of comorbidities:

- ENP: It appears from 48 hours to five days, without comorbidities.
- SNP: The patient presents hypotension and needs

IMV[2-3].

Medical history and physical examination were used to identify comorbidities, antimicrobial history, clinical signs of severity and criteria for IMV. This allowed a correct stratification and the initial search of the causative pathogen; it was also possible to adjust the increase in antimicrobials and perform a clinical assessment from 48-72 hours, which helped de-escalate and arrange in sequence the administration of these drugs.

RESULTS

As shown in **Table 1**, ENP predominated in this study with 50 patients (87.72%). The most frequently isolated bacteria were *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Acinetobacter baumannii*. When making the progressive assessment from the 48-72 hours after starting antibiotic treatment (**Table 2**) it was found that 44 ENP (88.0%) had a satisfactory outcome, and 6 ENP (12.0%) showed an unsatisfactory outcome; while the 3 patients with SNP (42.9%) progressed satisfactorily and 4 (57.1%) did not progress favorably.

Table 1. Stratification of acute nosocomial pneumonia and bronchopneumonia. Cardiovascular Intensive Care Unit, Celestino Hernández Robau University Hospital.

Type of NP	Nº	%
Early	50	87.72
Severe	7	12.28
Total	57	100.0

Source: Medical records

Table 2 also shows that, considering the total, 82.45% of the cases studied had a satisfactory outcome.

DISCUSSION

Clinical stratification allowed us to determine the severity of nosocomial pneumonia, because, depending on the variability of situations in which patients are involved, it is possible to identify some clinical categories or strata for determining the best place for treatment, the appropriate medical treatment and, in general, the differentiated therapeutic care for different groups, but homogeneous for individuals in the same category.

According to Brar[8], this necessary clinical stratification of acute pneumonia and bronchopneumonia in adults was presented, since 1993, by the American Thoracic Society. It was ratified by Niederman *et al*[9] in 2001, by Jordá Marcos *et al*[2] in 2004; and in 2011, Mangino *et al*[3] established the principles of stratification, already linked to the presence of cardiopulmonary disease and other modifiable risk factors, and targeting the different suspected causative agents. They also confirmed the importance of stratification as the main contribution to decide the place for treatment (medical ward or ICU), and incorporated new bacteriological information and therapeutic strategies.

In this study, the assessment from 48-72 hours allowed a de-escalation and sequencing of antimicrobial drugs, and their use for a short course, which led to a reduction in the use of these drugs, in microbial resistance, and in hospital stay and costs.

The existence of comorbidities, the patient's antimicrobial history and other factors are relevant in the presence of opportunistic and multiresistant microorganisms. These elements favor the suspicion of the causative agent; hence it is possible to start the treatment of the suspected germ[2-4].

A correct initial clinical stratification of the NP studied not only favored a better adjusted empirical treatment, but also allowed a progressive assessment from 48-72 hours and the use of simple and effective antimicrobial therapeutic procedures.

An initial satisfactory outcome prevailed in the early NP, as patients had fewer comor-

Table 2. Assessment of the outcome from 48-72 hours according to the stratum.

Type of NP	Outcome				Total	
	Satisfactory		Unsatisfactory			
	Nº	%	Nº	%	Nº	%
Early	44	88.0	6	12.0	50	87.72
Severe	3	42.9	4	57.1	7	12.28
Total	47	82.46	10	17.54	57	100.0

bidities and a good adherence to the clinical practice guidelines approved by the direction of the hospital.

The unsatisfactory outcome detected at 48-72 hours was observed with increased incidence in severe acute NP, which also had a high lethality. These NP were closely related to the presence of comorbidities, a positive antimicrobial history and cancer, and progressed with a stay longer than 5 days and the use of high doses of steroids. Moreover, in these severe NP, there was greater adherence to clinical practice guidelines and less delay in the increased initial empirical antimicrobial therapy, with monotherapy with trifamox first, followed by ceftriaxone or cefotaxime.

In cases where the risk factors and comorbidities were strongly associated with the antimicrobial indicated at the start, these drugs were combined with fourth-generation cephalosporins (meropenem) or ceftazidime and antipseudomonal aminoglycosides, prior to microbiological sampling of respiratory secretions and blood cultures.

The benefit-cost ratio of the change in treatment (parenteral/oral) in patients with NP of moderate to high risk is very important. The assessment from 48-72 hours is the fundamental tool to determine if the antimicrobial indicated is effective or not. It allows us to know, with the use of clinical parameters, the stability of the patient at that time, assess the microbiological results and apply other treatment strategies; for instance, simplify, arrange in sequence and de-escalate the antimicrobials[3,13-15].

Alvarez Lerma[11] and Gupta[15] state that in the face of diagnostic difficulties, particularly in elderly patients with comorbidities that do not favor the identification of the causative agent and, thus, hinder the selection of the best empirical treatment, the progressive assessment from 48-72 hours is a must.

CONCLUSIONS

The assessment of the initial severity and the subsequent clinical progressive assessment from 48-72 hours in NP is an important criterion for early diagnosis of the effectiveness/ineffectiveness of an antimicrobial therapy. It allows its adjustment, the use of new therapeutic strategies if necessary, or the timely suspension of treatment.

REFERENCES

1. Cabrera Rayo A, Laguna Hernández G, Villagómez Ortiz AJ, Méndez Reyes R, Guzmán Gómez R. Neumonía adquirida en hospitales. Un problema común que merece mayor atención. Med Int Mex. 2009;25:31-7.
2. Jordà Marcos R, Torres Martí A, Ariza Cardenal FJ, Álvarez Lerma F, Barcenilla Gaite F, Comisión de Expertos del Grupo de Trabajo de Enfermedades Infecciosas de la Sociedad Española de Medicina Intensiva, Crítica y Coronarias, *et al*. Recomendaciones para el tratamiento de la neumonía intrahospitalaria grave. Enferm Infecc Microbiol Clin. 2004;22:471-85.
3. Mangino JE, Peyrani P, Ford KD, Kett DH, Zervos MJ, Welch VL, *et al*. Development and implementation of a performance improvement project in adult intensive care units: overview of the Improving Medicine Through Pathway Assessment of Critical Therapy in Hospital-Acquired Pneumonia (IMPACT-HAP) study. Crit Care [Internet]. 2011 [citado 26 Sep 2014];15:R38[10 p.]. Disponible en: http://www.ccforum.com/content/pdf/cc9988.pdf
4. García-San Miguel L, Cobo J, Martínez JA, Arnau JM, Murillas J, Peña C, *et al*. La «intervención del tercer día»: análisis de los factores asociados al seguimiento de recomendaciones sobre la prescripción de antibióticos. Enferm Infecc Microbiol Clin. 2014; 32:654-61.
5. Rhew DC, Tu GS, Ofman J, Henning JM, Richards MS, Weingarten SR. Early switch and early discharge strategies in patients with community-acquired pneumonia: a meta-analysis. Arch Intern Med. 2001;161:722-7.
6. Avdic E, Cushinotto LA, Hughes AH, Hansen AR, Efird LE, Bartlett JG, *et al*. Impact of an antimicrobial stewardship intervention on shortening the duration of therapy for community-acquired pneumonia. Clin Infect Dis. 2012;54:1581-7.
7. Kaki R, Elligsen M, Walker S, Simor A, Palmay L, Daneman N. Impact of antimicrobial stewardship in critical care: a systematic review. J Antimicrob Chemother. 2011;66:1223-30.
8. Brar NK, Niederman MS. Management of community-acquired pneumonia: a review and update. Ther Adv Respir Dis. 2011;5:61-78.
9. Niederman MS, Mandell LA, Anzueto A, Bass JB, Broughton WA, Campbell GD, *et al*. Guidelines for the management of adults with community-acquired pneumonia. Diagnosis, assessment of severity, antimicrobial therapy, and prevention. Am J Respir Crit Care Med. 2001;163:1730-54.

10. Johanson WG, Pierce AK, Sanford JP, Thomas GD. Nosocomial respiratory infections with Gram-negative bacilli. The significance of colonization of the respiratory tract. Ann Intern Med. 1972;77:701-6.
11. Álvarez Lerma F, Sánchez García M, Lorente L, Gordo F, Añón JM, Álvarez J, *et al*. Paquete de medidas para la prevención de la neumonía asociada a la ventilación mecánica y su aplicación en las UVI españolas. El Proyecto «Neumonía Zero». Med Intensiva. 2014;38:226-36.
12. Apisarnthanarak A, Bhooanusas N, Yaprasert A, Mundy LM. Carbapenem de-escalation therapy in a resource-limited setting. Infect Control Hosp Epidemiol. 2013;34:1310-3.
13. Dünser MW, Festic E, Dondorp A, Kissoon N, Ganbat T, Kwizera A, *et al*. Recommendations for sepsis management in resource-limited settings. Intensive Care Med. 2012;38:557-74.
14. Rojo Enríquez A. Rivera Benítez C. Neumonía asociada a ventilación mecánica por Acinetobacter baumannii MDR en una unidad de terapia intensiva de tercer nivel. Acta Méd G Ang. 2014;12:57-64.
15. Gupta D, Agarwal R, Aggarwal AN, Singh N, Mishra N, Khilnani GC, *et al*. Guidelines for diagnosis and management of community- and hospital-acquired pneumonia in adults: Joint ICS/NCCP(I) recommendations. Lung India. 2012;29:S27-62.