UNIVERSIDADE DE LISBOA

FACULDADE DE MEDICINA LISBOA

TRABALHO FINAL
MESTRADO INTEGRADO EM MEDICINA

Clínica Universitária de Medicina II

Austrian Syndrome: report of an exceptionally rare and deadly syndrome

Tania da Silva Carvalho

Fevereiro'20

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Orientado por:

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ABSTRACT

Austrian syndrome is a rare entity due to pneumococcal infection and associated with a very high mortality due to involvement of cardiac valves. In the context of infection by this microorganism, endocarditis is usually not considered except if clinical manifestations become clear. Therefore, there is a need for a larger awareness for this association.

I present a case of Austrian syndrome in a previously healthy 67-year-old woman. She featured with mental state alteration, respiratory failure and shock, and was diagnosed with ceftriaxone-sensitive pneumococcal bacteremia, meningitis and pneumonia. Transesophageal echocardiogram revealed a vegetation of the mitral valve. Despite an improvement of her medical condition, the patient remained on coma (Glasgow coma scale of 4), and eventually died.

Even though the major cause of mortality in Austrian syndrome is cardiac involvement, in this case it was due to meningitis. Since there are only few reported cases worldwide, and more data is required to identify risk-factors, I emphasize the need of early diagnosis of the triad and early and adequate antibiotic therapy. To the best of my knowledge, this is the first case report of Austrian syndrome in Portugal.

RESUMO

A síndrome de Austrian é uma entidade rara causada por uma infeção pneumocócica e está associada a elevadas taxas de mortalidade graças ao envolvimento das válvulas cardíacas. Num contexto infecioso causado por este microrganismo, geralmente a endocardite não é equacionada a não ser que as manifestações clínicas se tornem evidentes. Deste modo, é necessário um maior alerta para esta tripla associação.

Apresento um caso de síndrome de Austrian numa doente do sexo feminino com 67 anos de idade, previamente saudável. Clinicamente, apresentava alteração do estado de consciência, falência respiratória e choque, tendo sido diagnosticada com bacteriémia pneumocócica sensível a ceftriaxona, meningite e pneumonia. Foi realizado um ecocardiograma transesofágico, que evidenciou uma vegetação na válvula mitral. Apesar da melhoria do estado clínico, a doente permaneceu em coma (GCS 4), acabando por morrer.

Apesar da principal causa de morte da síndrome de Austrian estar relacionada com patologias de envolvimento cardíaco, neste caso deveu-se a meningite. Uma vez que existem poucos casos clínicos descritos mundialmente e é necessária mais evidência que permita a identificação de fatores de risco, sublinho a necessidade para um diagnóstico precoce da tríade

e a implementação de terapêutica antibiótica precoce e adequada. Segundo o meu melhor conhecimento este é o primeiro caso clínico de síndrome de Austrian descrito em Portugal.

KEY WORDS

Austrian syndrome, *Streptococcus pneumoniae*, Meningitis, Pneumonia, Endocarditis

PALAVRAS CHAVE

Síndrome de Austrian, *Streptococcus pneumoniae*, Meningite, Pneumonia, Encocardite

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INTRODUCTION

The triad of pneumonia, meningitis and endocarditis caused by *Streptococcus pneumoniae*, also known as Austrian syndrome, is a clinical rarity. It was first described by Robert Austrian in 1956, when he reported 8 cases of which 6 ended up dead, mainly for aortic valve involvement. Nonetheless, Heschl in 1862 and Osler in 1881 had already questioned the hypothesis of a relationship between endocarditis, pneumonia and meningitis[1].

It is most frequent in patients with history of alcoholism and has a high mortality rate (32,4%)[2], despite the appropriate antibiotic treatment. This is mainly due to cardiac valve destruction (most frequently, the aortic valve) and acute cardiac failure[1]. I describe a case of Austrian syndrome in a previously healthy patient, with mitral endocarditis in the triad and death due to meningitis. To the best of my knowledge, this is the first case report of Austrian syndrome in Portugal.

CASE REPORT

A 67-year-old woman, previously healthy, was admitted in the ICU for sudden coma. She was found unresponsive at home for indeterminate time. On admission, she had a Glasgow coma scale score (GCS) of 3, polypnea and chest retraction. Patient was tachycardic (118 beats/minute), hypothermic (33.3ºC), hypotensive (blood pressure of 91/56 mm Hg) and had peripheral cyanosis. Pulmonary auscultation revealed bibasal crackles. The arterial blood gas count showed severe hypoxemia (SaO2 78%, pO2 52.4 mmHg and pCO2 53 mmHg). Lab evaluation also revealed an acute kidney injury (serum creatinine 1.57 mg/dL, urea 120 mg/dL), hepatic injury (total bilirubin 3.45 mg/dL, alanine aminotransferase 88 U/L, aspartate aminotransferase 43 U/L), rhabdomyolysis (creatine kinase 1373 U/L) and elevated inflammatory markers (leukocytosis of $19.1x10^9$/L, 95% neutrophils, and c-reactive protein of 48.78 mg/dL). Lumbar puncture showed a xanthochromic cerebro-spinal fluid, with glucose <20 mg/dL, leukocytes 46/mm^3 (predominance of polymorphonuclear leukocytes) and proteins 1110 mg/dL. Blood, cerebrospinal fluid and bronchial secretions cultures were positive for *Streptococcus pneumoniae*, sensitive to ceftriaxone. Chest radiography showed bilateral consolidation (Figure 1). Transesophageal echocardiogram revealed a vegetation of the anterior mitral valve leaflet. EEG showed slow activity and denied status epilepticus. CT was performed and showed evidence of hydrocephalus and an external ventricular drain was placed (Figure 2), but she remained with a GCS of 4.

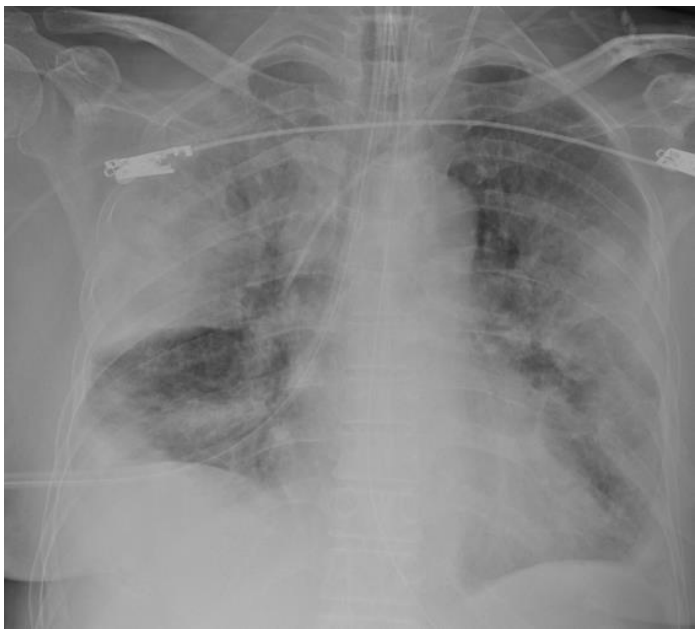

Figure 1: Thoracic x-ray with bilateral infiltrates.

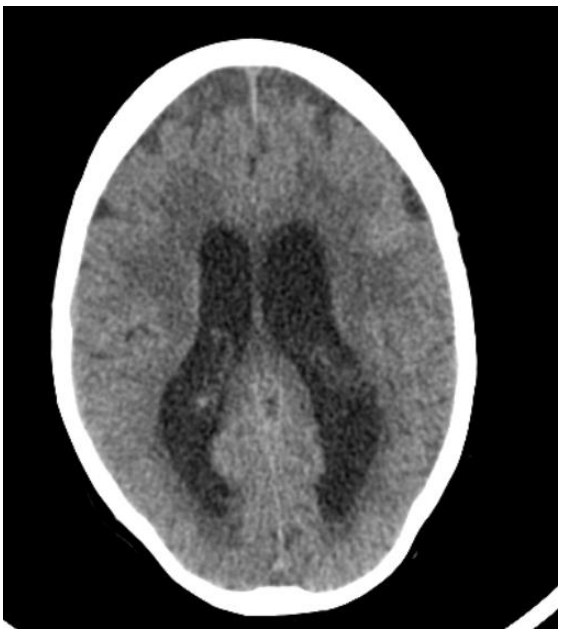

Figure 2: CT scan on coronal view showing hydrocephalus.

On admission, the patient was intubated and started fluid resuscitation as well as vasopressors (norepinephrine, with a maximum dose of 0.22 mcg/Kg/min). Initial empirical antibacterial therapy was made with ceftriaxone, clarithromycin and vancomycin, de-escalated to ceftriaxone alone after acknowledgment of culture sensitivity tests. 5 days of dexamethasone were administered. Clinical evolution on the ICU was characterized by an improvement of inflammatory markers (CRP highest level was 39.1 mg/dL, with a decrease to 7.43 mg/dL), with resolution of pneumonia, kidney and hepatic injuries. Despite that, she remained on coma (GCS 4). After excluding reversible causes like status epilepticus, a bad neurologic outcome was established, and she was put on palliative care. She died on the 18th day after admission.

DISCUSSION

Pathogenesis

Austrian syndrome is a systemic infection caused by *Streptococcus pneumoniae* and, although this is the most frequent organism causing pneumonia and meningitis in adults, it is a rare cause (3%) of endocarditis since the introduction of penicillin[3].

Streptococcus pneumoniae is a Gram-positive pathogen and it is considered a colonizer of the upper respiratory tract. The carriage rate is up to 27–65% in children and <10% in adults. Once the bacteria colonize nasopharynx, it can progress to invasive disease. This is more common in young children, elderly people and patients with comorbidities[4]. As an example, during a co-infection with *Influenza*, there is synergistic type-1 interferon response, which impairs the recruitment of macrophages, leading to a decreased clearance of bacteria from the nasopharynx and increased risk of pneumonia[5].

It has been described that in the presence of bacterial meningitis, 17% of patients develop pneumonia as a complication, but only 2.3% develop endocarditis[6]. Other study concluded that in a patient with pneumococcal endocarditis (PE), 42% also had pneumonia, 40.5% had meningitis as well and 26.1% were diagnosed with Austrian syndrome[7].

Pneumonia seems to be the first element of the triad[2]. When *Streptococcus pneumoniae* reaches the lower respiratory tract, it can surpass the immune defenses and adhere to the alveolar epithelium, replicate and cause pneumonia. Then, by hematologic progression, it can spread to the central nervous system (by passing the blood-brain barrier vascular endothelial cells)[8] and/or to the heart[9]. If endocarditis is a consequence of meningitis or vice versa is unknown[6]. A particularity in this case report is the fact that it appears that pneumonia, meningitis and endocarditis started approximately at the same time.

Epidemiology

Austrian syndrome is more frequent in men (64,9%) and the mean age of presentation is 52 years old, but it can also occur in children. Actually, the range of ages is wide, going from 7 to 90 years old, even though there are only two reported cases in pediatric age (one with 7 years old and the other with 13 years old)[2]. The incidence increases with age, possibly by gradual reduction of the capacity to mount an effective immune response (including T and B-cells, neutrophils, macrophages and dendritic cells) also known as immunosenescence[10].

However, aging cannot be the only predisposing factor since the mean age of presentation is 52 years old.

Risk factors

Alcoholism is the most common risk factor, occurring in 37,88% of cases[2]. It has been suggested that alcoholism induces immunological defects such as impaired chemotaxis, dysfunctional reticuloendothelial system and impaired delayed-type hypersensitivity. Also, malnutrition and propensity to aspiration that frequently happens with alcoholic predispose them to pneumococcal diseases[11]. Other predisposing factors include systemic corticotherapy, diabetes mellitus, splenectomy, HIV infection, haematological neoplasias, solid organ or hematopoietic cell transplantation, *Influenza* infection, chronic renal failure, pregnancy and the post-partum period or other condition in which the immune system is compromised[12][13][14]. Nevertheless, 12,2% of the patients were previously healthy, without any past medical history reported[2]. We might speculate that a non-described immune defect in apparently healthy individuals would explain Austrian Syndrome. Our patient presented with a persistent lymphopenia, but its etiology was unclear, and no other risk factor could be encountered.

Clinical features

Austrian syndrome, generally, is severe and has an acute evolution and in 32,4% of cases patients end up death[2].

Endocarditis

Pneumococcal endocarditis is the great cause of the high mortality rate in Austrian syndrome due to the complications that may arise (perivalvular abscesses and valvular regurgitation, perforation, congestive heart failure and systemic embolization due to the formation of large vegetations)[12][7]. It settles in native valves, generally, and is more frequent on the left side and the aortic valve is affected in 49,32% of patients with Austrian syndrome, the mitral valve is affected in 28,77% of cases and in 13,7% of cases both valves are affected. Why the aortic valve is preferably attacked stills unknown[2].

Bacteremia is crucial in the pathophysiology of endocarditis [15]. In a patient with a known infection, such as pneumonia, that doesn’t improve their clinical status under correct treatment, having symptoms like fever and the presence of a new cardiac murmur, it is

important to perform blood cultures and an echocardiogram aiming to found vegetations [6]. The transesophageal echocardiogram (TOE) is more sensitive than transthoracic echocardiography (TTE) but it is an invasive technique. TTE is often performed first. Then, if it has a negative result and the suspicion of endocarditis continues, a TOE is recommended [15]. Nevertheless, even in the absence of signs and symptoms we cannot completely rule out the possible diagnosis of endocarditis [6]. The same principle applies to negative blood cultures, since these patients may already be on antibiotics regimen [15].

The diagnosis is made upon modified Duke criteria, which includes microbiology, image and clinical features [16].

This case report involved the mitral valve and the need for surgical intervention was excluded.

Pneumonia

Community-acquired pneumonia (CAP) is the main cause of death among infectious diseases and it is the seventh cause of overall death in the United States [17]. It is mainly caused by *Streptococcus pneumoniae*. Typical symptoms include fever, cough, sputum or dyspnea. The severity of the disease should be evaluated, using CURB-65, for example[18]. As for the diagnosis, it is only recommended to obtain sputum and blood cultures when CAP is considered severe, the patient is being empirically treated for/were previously infected with MRSA or *P. aeruginosa* or was hospitalized in the last 90 days and received parenteral antibiotics [19]. Considering the severity of the infection in Austrian syndrome, it is expected that these diagnostic tests are performed. Chest imaging should not be done unless the diagnosis is doubtful, when the patient is at risk to develop a lung disease (such as lung cancer) or when the clinical evolution is not satisfying [18].

Meningitis

Streptococcus pneumoniae is responsible for 70% of meningitis [20]. Although bacterial meningitis has a low incidence (1-2 cases per 100,000 adults, annually[21]), mainly thanks to the widespread of vaccination, 18–30 % of patients die and in half of survivors neurological sequelae occur, including focal neurological deficits, cognitive deficits and hearing loss [20][22]. It is known that, during the infection, there are a induction of processes including infiltration of leukocytes, abscess formation, cytotoxic and vasogenic oedema and compression of vital brains structures that end up with parenchymal damage, leading to minor or major impact on sequelae, depending on the severity of those mechanisms [20].

Other complications include stroke (in up to 30% of patients diagnosed with pneumococcal meningitis), cerebral venous thrombosis (in 9%) and intracerebral hemorrhage (in up to 9%) [22].

The classical symptoms include headache, fever, neck stiffness and altered mental status. To confirm the diagnosis a lumbar puncture should be performed, unless there is any contraindication [23].

Treatment

The use of antibiotics is the basis of the treatment of Austrian syndrome. If initially, *Streptococcus pneumoniae* was susceptible to penicillin, in a question of few decades, reports began to demonstrate the existence of resistant strains to multiple drugs, including penicillin, tetracycline, erythromycin, chloramphenicol, clindamycin or rifampicin[24].

Streptococcus pneumoniae can change the penicillin binding proteins (PBPs) which decreases the affinity of penicillin to those PBPs. However, not all β-lactams bind to the same PBPs, so cefotaxime, ceftriaxone, amoxicillin, piperacillin and imipenem/cilastatin are active against the microorganism[25].

For macrolides, the prevalence of resistance is about 20-40%, for lincosamides is 21,8%, for tetracyclines is 25,9%, for trimethoprim-sulfamethoxazole is about 25-45% and for fluoroquinolones is <1%-2%. Even though fluoroquinolones have a spectrum of appealing characteristics, such as a broad spectrum coverage, excellent bioavailability, high serum levels and tissue concentrations, it must have a restricted use to prevent the rise of resistance [24].

Since the probability of resistance is high, in some countries the therapeutic scheme should start with empirical cefotaxime or ceftriaxone associated with vancomycin, until the results of antimicrobial susceptibility testing are known[7][26]. So far, it seems licit to do an empirical approach with β-lactams in Portugal, due to low described resistances. Directorate-General of Health (DGS) reported that *Streptococcus pneumoniae* resistance appears to be stable in the last few years (2014-2017) for penicillin, varying between 10,2% and 12,8%. The non-crescendo evolution also occurs for macrolides, which rates of resistances varied between 15,1% and 17% [27]. It is recommended a 10 to 14 days of antibiotic treatment duration. As explain above, the greater the central nervous system parenchymal damage, the greater the sequelae. In order to prevent this, it is recommended to add dexamethasone to the scheme as adjunctive treatment. In several trials, there is evidence that the administration of this corticosteroid, before or with first dose of antibiotics, for 4 days, is associated with a significant

better outcome. However, the administration of dexamethasone is not appropriated on immunosuppressed patients [26].

Concerning cardiac surgery due to endocarditis, around a half of patients is submitted to a valve replacement because of severe complications. Guidelines refer that heart failure, uncontrolled infection and prevention of embolism are indications to perform surgery [28], but decisions should be individualized. Risk-benefit and time of surgery must be well estimated. Large vegetations and overt heart failure may suggest the need of early intervention [29]. In terms of survival, from those who received a new prosthetic valve, 90% survive, against the 57% survival of patients without surgery[6][7].

Prevention

Since *Streptococcus pneumoniae* is one of the most common infection bacteria (causing infections such as otitis media, sinusitis, community-acquired pneumonia and meningitis) and since is a great cause of morbidity and mortality worldwide [4][8], efforts were made and continue to be to achieve vaccines that prevent patients from suffer from this kind of infections.

There are two types of vaccines: conjugated vaccines (covering 7, 10 or 13 serotypes) and a polysaccharide vaccine (which covers 23 serotypes). The more used ones are 13-valent pneumococcal protein-conjugate vaccine (PCV13) and the 23-valent polysaccharide vaccine (PPSV23). If the first one is targeted to pediatric age, the second one is used mainly in the elderly and for high-risk groups[30].

PCV13 covers less serotypes but has the advantage to create immunological memory for long periods of time and is responsible for mounting an immune response on nasopharynx colonies, which decrease the transmission rates, causing a positive impact because of the herd immunity. On the other hand, PPSV23 covers more serotypes, but the duration of immunity is around 3 to 10 years and it does not have an impact on nasopharynx colonies [31].

Studies comparing both vaccines came to the conclusion that PCV13 is better at decreasing the rates of invasive pneumococcal disease, with an estimated efficacy of 75% [32]. Even though PPSV23 reduces the rates of invasive pneumococcal disease, it has no impact on overall mortality and even in immunocompetent patients, the efficacy decreases with aging [33]. Actually, it is referred that PPSV23 has a limited ability of prevention disease in the elderly people when administrated alone [32].

Furthermore, vaccines can play an important role at preventing the increasing antibiotic resistance, since PPSV23 include >85% of serotypes in which penicillin resistance is found [25].

In terms of prevention, it is questionable if Austrian syndrome is a preventable entity or not. The serotypes 6, 6A, 8, 9V, 12, 12F, 14, 18C, 20, 22F, 23B were responsible for previously reported cases [2]. Of these 11 identified serotypes, 8 are included on current vaccines (3 on PCV13 and 7 on PPSV23) [34].

CONCLUSION

Austrian syndrome has an acute and highly aggressive clinical evolution. This case-report aims to emphasize this complex association, highlighting that a patient with a pneumococcal pneumonia and/or meningitis must raise awareness on the possibility of concomitant endocarditis. Early diagnosis and prompt adequate treatment can only be achieved through high clinical suspicion. More data is required to identify risk-factors for this clinical condition.

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RESUMO DO TRABALHO FINAL DE MESTRADO: "AUSTRIAN SYNDROME: REPORT OF AN EXCEPTIONALLY RARE AND DEADLY SYNDROME"

Tania da Silva Carvalho

A síndrome de Austrian é uma entidade clínica rara, composta pela tríade de pneumonia, meningite e endocardite a *Streptococcus pneumoniae.* Esta associação foi descrita pela primeira vez por Robert Austrian em 1956, mas já em 1862 (por Helschl) e em 1881 (por Osler) foi colocada a hipótese de haver alguma relação entre as 3 patologias.

Quanto ao caso clínico descrito, centra-se numa doente de 67 anos, previamente saudável, com quadro inaugural de alteração do estado de consciência. À admissão apresenta-se com alteração do estado de consciência (3 na escala de coma de Glasgow), falência respiratória e choque. Dos achados ao exame objetivo destaca-se: hipotermia, polipneia, taquicardia, hipotensão, cianose periférica e auscultação de fervores em ambas as bases pulmonares. O recurso a exames complementares de diagnóstico evidenciou: hipoxémia grave, lesões renal aguda e hepática, rabdomiólise e elevação dos parâmetros de inflamação, punção lombar com achados característicos de meningite, radiografia torácica com condensação bilateral e ecocardiograma transesofágico com presença de uma vegetação na válvula mitral. Adicionalmente, a identificação de *Streptococcus pneumoniae* em hemoculturas, no líquido céfalo-raquidiano e em secreções brônquicas levaram ao diagnóstico de síndrome de Austrian. Foi instituída empiricamente terapêutica antibiótica tripla (ceftriaxona, claritromicina e vancomicina) e, posteriormente, após resultados do teste de sensibilidade aos antibióticos, o tratamento foi reduzido para apenas ceftriaxona. Também foi realizado um ciclo de 5 dias de dexametasona. Embora com evolução laboratorial favorável, nomeadamente com parâmetros inflamatórios em cinética descendente, e com resolução do quadro de pneumonia, persistiu quadro de coma (4 na escala de coma de Glasgow), o que culminou no óbito intra-hospitalar da doente.

Tal como referido anteriormente, a síndrome de Austrian corresponde a uma infeção sistémica causada por *Streptococcus pneumoniae*. Apesar deste microrganismo ser um dos principais responsáveis pelo desenvolvimento de pneumonia e meningite em idade adulta, é uma etiologia rara de endocardite. É um colonizador do trato respiratório

superior em 27-65% das crianças e <10% dos adultos. Com origem na nasofaringe, pode progredir para doença invasiva, principalmente em crianças, idosos ou doentes com comorbilidades associadas. A infecção por *Streptococcus pneumoniae* pode progredir ao longo da via aérea e atingir o trato respiratório inferior, originando pneumonia. Posteriormente, por disseminação hematológica, pode atingir o sistema nervoso central e o coração, causando meningite e endocardite, respetivamente.

Em termos epidemiológicos, a síndrome de Austrian é mais frequente em homens (64,9%) e a idade média de apresentação é de 52 anos. Na verdade, o espetro de idades vai desde os 7 aos 90 anos de idade, ainda que existam apenas 2 casos clínicos descritos em idade pediátrica (um com 7 e outro com 13 anos).

Quanto a fatores de risco, o alcoolismo é o mais comum, ocorrendo em 37,88% dos casos. Uma vez que o alcoolismo induz alterações deletérias importantes no sistema imunitário e uma vez que os alcoólicos têm um maior risco de malnutrição e propensão para aspiração, o risco de desenvolvimento de doenças pneumocócicas é maior neste grupo. Outros fatores que podem predispor ao desenvolvimento de síndrome de Austrian incluem situações moduladoras do sistema imunitário: corticoterapia sistémica, diabetes *mellitus*, esplenectomia, infeção por VIH ou *Influenza*, doença renal crónica, gravidez e período pós-parto, neoplasias hematológicas ou realização de transplantes. Curiosamente, na maioria das séries, em até 12,2% dos casos, os doentes eram previamente saudáveis.

Clinicamente, a síndrome de Austrian apresenta uma elevada taxa de mortalidade: 32,4%, de acordo com a mais recente revisão sobre o tema. A causa de morte é predominantemente cardiológica, onde se incluem abcessos perivalvulares, regurgitação valvular e perfuração, com insuficiência cardíaca associada, ou embolização sistémica de vegetações valvulares. A endocardite surge mais frequentemente em válvulas nativas, sendo a válvula aórtica afetada em 49,32% dos casos e a mitral em 28,77%. O envolvimento de ambas as válvulas acontece em 13,7% dos casos. A endocardite pode ser clinicamente insidiosa, pelo que, num doente com diagnóstico ativo de pneumonia pneumocócica de evolução desfavorável (nomeadamente por persistência de febre, ou com sopro cardíaco de novo), a suspeita de endocardite deve ser levantada.

Ao contrário daquilo que acontece com a endocardite, o principal agente causal da pneumonia adquirida na comunidade e da meningite é o *Streptococcus pneumoniae*. Os sintomas típicos da pneumonia incluem febre, tosse com expetoração e dispneia. Nos

casos de pneumonia grave (avaliada segundo o score CURB-65), em doentes tratados empiricamente para MRSA ou *P. aeruginosa* ou que foram previamente infetados por estes agentes ou que estiveram internados nos últimos 90 dias e estiveram sob antibioterapia parentérica é aconselhado a colheita de sangue para hemoculturas e a colheita de expetoração. Quanto à meningite, apesar desta ter uma baixa incidência, tem uma alta taxa de mortalidade e em cerca de metade dos casos os doentes sofrem sequelas, entre as quais, défices focais neurológicos, défices cognitivos ou diminuição da acuidade auditiva. Os sintomas típicos incluem cefaleia, febre, rigidez da nuca e alteração do estado mental, devendo o diagnóstico ser confirmado pela realização de uma punção lombar.

A base do tratamento da síndrome de Austrian é a antibioterapia. Se outrora o *Streptococcus pneumoniae* era sensível à penicilina, com o advento das resistências aos antibióticos esta deixou de ser universalmente eficaz no tratamento deste microrganismo. Deste modo, nalguns países, o tratamento empírico deve contemplar a associação entre cefotaxime e vancomicina até que os resultados dos testes de sensibilidade aos antibióticos estejam disponíveis. A epidemiologia portuguesa, à data, não parece tornar necessária esta associação antibiótica empírica. Relativamente à duração da terapêutica, aconselha-se um período entre 10 a 14 dias de antibioterapia. Uma vez que durante o processo de meningite se desenvolvem mecanismos que podem lesar o parênquima do sistema nervoso central (através de edema citotóxico/vasogénico e compressão de estruturas cerebrais vitais), é aconselhada como terapêutica adjuvante o uso de dexametasona. Há robustez científica que associa o uso de corticoterapia neste cenário a melhoria de prognóstico vital e neurológico.

Quanto ao envolvimento cardíaco, cerca de metade dos doentes com síndrome de Austrian são submetidos a cirurgia de substituição valvular. Insuficiência cardíaca aguda, infeção não controlada e prevenção de embolia são indicações para avançar com o procedimento, no entanto, têm que ser contrabalançados os riscos e benefícios da intervenção cirúrgica. Dos doentes submetidos a cirurgia, a sobrevida média é de 90%, por oposição a 57% dos que não são submetidos a cirurgia, embora estes dados possam sofrer de óbvios vieses de seleção.

Por último, em termos de prevenção, pode questionar-se se a síndrome de Austrian é uma entidade evitável ou não. Isto porque, dos 11 serotipos identificados em casos anteriores de síndrome de Austrian, 9 estão incluídos nas vacinas atualmente disponíveis

no mercado: 2 dos serotipos na vacina pneumocócica conjugada 13-valente e 7 dos serotipos na vacina polissacarida 23-valente.

Concluindo, a síndrome de Austrian tem uma evolução clínica rápida e extremamente agressiva. Este trabalho tem como objetivo enfatizar esta complexa associação, reafirmando que um diagnóstico precoce e a instituição de terapêutica adequada só são possíveis através de um alto grau de suspeição clínica.