CASE REPORT

POLYMICROBIAL INFECTIVE ENDOCARDITIS WITH ANTERIOR SPINAL ARTERY SYNDROME IN A DRUG ADDICT

Guo-Mou Jong, Yin-Chin Chung, Chenden Young and Liang-Miin Tsai

Section of Infectious Diseases, Department of Internal Medicine, National Chen Kung University Hospital, Tainan, Taiwan 70428

Right-sided endocarditis has increased in frequency since the 1970's, and it accounted for 14% of total infective endocarditis (Robbins *et al,* 1986) and 54% of drug addicts who developed endocarditis (Tuazon and Sheagren, 1974). *Staphylococcus aureus* is the most common pathogen, which is in contrast to the streptococcal association in left-sided endocarditis (Osler, 1885). Polymicrobial infective endocarditis is uncommon. Most of these patients were intravenous drug abusers, and had high surgical rates and mortality rates (Saravolatz *et al,* 1978).

The incidence of neurologic complications in infective endocarditis is 20 to 40% (Ziment, 1969). Major cerebral embolization is the most common one and accounts for approximately 40% of the total neurologic complications (Lerner, 1985), among which the anterior spinal artery syndrome is rather rare (Dominic and Rossier, 1983), and if it does occur, it usually involves the thoracic region (Henery, 1986). Involvement of the cervical region is rare because the artery is large in diameter and has substantial collateral circulations (Lazorthes *et al,* 1971). We report here a case of acute polymicrobial infective endocarditis with anterior spinal artery syndrome in a drug addict.

This 44-year-old male, an employee of an ironworks, had used injectable pentazocin and morphine for 10 years.

Seven days before admission, he began to suffer from weakness and pain over the right upper limb, the next day upper left limb pain followed. No definite chill or fever could be traced. On the day of admission quadriplegia developed suddenly. He was brought to the emergency room and was admitted to the intensive care unit with shock status.

Physically the patient was drowsy. Blood pressure was 100/70 mmHg with dopamine infusion. Pulse rate was 97/minute, body temperature was 37.2°C and respiratory rate was 26/minute. The conjunctivae were not pale and there were some hemorrhagic spots. The neck was supple without palpable lymph nodes or engorged jugular veins. The respiratory pattern was symmetric and regular with bilateral clear breathing sounds. A grade I-II/VI systolic blowing murmur was audible over the left sternal border. The abdomen was soft and flat, liver and spleen were impalpable. The extremities were flaccid and no cyanosis or pitting edema were found. There were numerous petechiae over palms and soles. Two fibrotic injection holes were found over bilateral inguinal regions.

Neurologically, the cranial nerves were intact. Muscle power was completely flaccid over four extremities except for abduction of the bilateral shoulder girdles. The deep tendon reflexes were absent. Sphincter function was also impaired. Hyperesthesia was noted at the bilateral dermatomes, C6 level, with loss of pain and temperature sensation below them. However, the perception of joint position and vibration were intact. Roth's spots were found bilaterally over the fundi.

The initial multichemistry screen disclosed: creatinine: 3.2 mg/dl (normal value : 0.5-1.6) blood urea nitrogen: 39 mg/dl (9-23 mg/dl), bilirubin : 1.45 mg/dl (0.2-1.2), alanine aminotransferase : 48 U/dl (16-40), asparate aminotransferase: 61 U/dl (10-40), alkaline phosphatase: 225 U/dl (36-92), albumin: 1.6 g/dl (3.0-5.0), globulin: 3.4 g/dl (All the above abnormal data returned to normal range after treatment). The white blood cell count was 19,800/mm^3 with 8% band forms and 86% polymorphonuclear leukocytes. The hemoglobin concentration was 12.1 gram/dl, and

the platelet count was 72,000/mm^3. Prothrombin time was 12.5 seconds (control: 11.5), and the activated partial thromboplastin time was 30 seconds (26.5). Urinalysis showed microhematuria with 30-35 RBC in high power field, and protein and sugar were present in trace amounts.

Chest x-ray showed no definite pneumonic patches. The EKG revealed a normal sinus rhythm. Echocardiogram upon admission showed mild thickening of the anterior mitral leaflet with mild mitral regurgitation and minimal thickening of the tricuspid valve with trivial tricuspid regurgitation. Seven days later a vegetation measuring 1.2 × 0.8 cm over the anterior mitral leaflet and a small vegetation measuring 0.5 cm × 0.5 cm over the tricuspid valve were found (Fig 1 A, B).

Three sets of blood cultures all grew group G *Streptococcus* and oxacillin-resistant *Staphylococcus aureus*. A daily 2 g dose of vancomycin was prescribed for four weeks in combination with gentamicin during the initial 2 weeks. Penicillin G was given for four weeks for better coverage of *Streptococcus*. An episode of *Pseudomonas aeruginosa* urinary tract infection occurred and was well controlled by piperacillin during the hospitalization period. The patient's general condition was good, except several episodes of minor embolization and fluctuation of fever in the first 3 weeks. There was no vegetation found on follow up echocardiogram on the 15th day. Initial CT scan of the brain and spinal cord showed no definite lesions and follow up CT scan was negative. Magnetic resonance image (MRI) also revealed no difinite lesions over the brain and spinal cord. The patient received rehabilitation for one month and was discharged with little improvement of his neurologic status.

In viewing of the clinical picture of this patient, systemic embolization was evident and echocardiography revealed two vegetations on the mitral and tricuspid valves. Blood cultures grew group G *Streptococcus* and oxacillin-resistant *Staphylococcus aureus* (ORSA) in three consecutive blood samplings. Vancomycin was prescribed for four weeks together with gentamicin in the first two weeks. Penicillin was also given for four weeks due to fluctuated fever in the first three weeks.

The patient developed sudden onset of quadriplegia seven days after pain and weakness of the upper bilateral extremities. Anterior spinal artery (ASA) syndrome was clinically diagnosed from

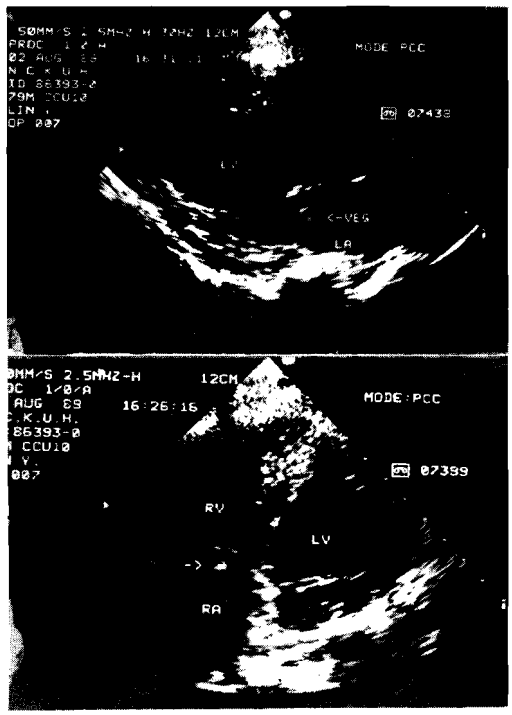

Fig 1—A, B : Vegetations (arrow) over mitral valve (A) and tricuspid valve (B) noted 7 days later. (A : parasternal long axis view. B : apical four chamber view)

the neurological symptoms which showed quadriplegia and loss of sensation of pain and temperature with preservation of proprioception and vibration sense. The ASA syndrome in this patient might have been due to infarction caused by embolization of vegetation from endocarditis. The anterior spinal artery supplies the anterior two-thirds of the spinal cord where the motor neurons and spinothalamic tract reside. So a lesion at this artery produces the above typical neurological manifestations. CT and MRI helped to rule out other vascular lesions such as A-V malformation, angioma, or neoplasm. According to Sandson *et al* (1989), diagnosis of presumed spinal cord ischemia requires the appropriate clinical picture and exclusion of other possible etiologies. Definite diagnoses have usually required postmortem examination.

Polymicrobial bacteremia has been an increasing clinical entity since 1970 (Hermans and

Washington, 1970). Neurological illness, malignant neoplamsm and decubitus ulcer were the most common underlying conditions (Roselle and Watanakunakorn, 1979). Gram-negative aerobic bacteria were the most common organisms isolated in the report of Kiani *et al* (1979), and aerobic streptococci in that of Roselle and Watanakunakorn (1979). The mortality is around 50%.

Polymicrobial infective endocarditis is even more uncommon, and there were thirty one cases reported before 1978 (Saravolatz *et al,* 1978.) 84% of them were drug addicts, and 14% occurred after cardiac surgery. In these cases, the most commonly encountered organisms were *S. aureus, Candida,* non-group D streptococci, *Pseudomonas,* and *Serratia.* These mixed infections carried a high mortality rate (more than 30%) and 52% needed heart surgery. This contrasts with the 15% of patients with single organism endocarditis who required surgery. The high incidence of surgery may be related to the frequent occurrence of *Candida* and *Pseudomonas* as causative agents. The ultimate outcome of a patient with polymicrobial endocarditis was related to the type of infecting pathogen rather than to the number of pathogens present (Saravolatz *et al,* 1978).

Group G *Streptococcus* was isolated from our patient. This organism has been recognized as part of the normal flora of the pharynx, skin, intestinal tract and vagina, and the cause of infections including endocarditis, septic arthritis, pharyngitis, puerperal sepsis and septic abortion, neonatal sepsis, pleuropulmonary infection, peritionitis, meningitis, cellulitis and bursitis and tenosynovitis. Vartian *et al* (1985) reported 57 patients with group G *Streptococcus* infection, including six cases of endocarditis. A second organism was isolated simultaneously in 15 (26%) of 57 patients, and one in the six patients with endocarditis. Another report in 1986 showed seven of fifteen patients with group G *Streptococcus* infection having acute endocarditis, and three of them died (Venezio *et al,* 1986). Polymicrobial infection, particularly with *S. aureus* is an important feature of infection associated with group G *Streptococcus* (Lam and Bayer, 1983)—the same bacteriologic findings in our patient. Intravenous drug abuse has been an important feature in infective endocarditis recently. The tricuspid valve is most often involved in drug addicts, accounting for about 50% of lesions; 6% had mixed left and right-sided endocarditis (Haller, 1988; Reisberg, 1979). In right-sided endocarditis, *S. aureus* accounts for 60-80% of the cases (Harrington, 1925; Robbins *et al,* 1986). This is in marked contrast to the bacteriologic findings of patients with left-sided endocarditis in which streptococcal species account for approximately 50% of these cases (Robbins *et al,* 1986). This might be due to higher rate of carriage of *S. aureus* in drug addicts (Tuazonand and Sheagren, 1974).

The significance of nervous system complications of bacterial endocarditis has been recognized since 1885 when Osler first emphasized the clinical importance of the triad of fever, heart murmur, and paraplegia (Osler, 1885). In the majority of series, the recorded incidence of neurologic complications during the course of bacterial endocarditis is 20-40% (Ziment, 1969; Lemer 1958). All these events derive from eboli of endocardial vegetation. So far, there is little available literature citing embolic infraction of the spinal cord from bacteria endocarditis (Harrington, 1925). As to ASA syndrome, spinal cord angioma, post-infection or vaccination were the most common known causes in Dominic's review (Dominic and Rossion, 1983). Occlusive lesion of the anterior artery accounted for only nine of the 60 cases.

There are 31 pairs of spinal arteries that enter the vertebral cannel through the intervertebral foramen. Each spinal artery may then become either an anterior or posterior radicular artery. Most of these vessels end within the nerve roots, dura or pia mater, and usually only 6 to 8 large anterior radicular arteries account for most of the blood supply to the anterior spinal cord (Lazorthes *et al,* 1971). The anterior spinal artery below the upper cervical segment is made up of anastomoses between these vessels. The ASA syndrome most often involved the midthoracic region (Henery *et al,* 1986), because its vascularization generally comes from a single radicular artery (Lazorthes *et al,* 1971). So it is most vulnerable to vascular accident. However, the level of involvement of our patient was at C6. The anterior spinal artery in the cervical region is large and has many collateral circulations from occipital, deep cervical, and ascending arteries. The explanation for this uncommon lesion of cervical spinal cord may be that in addition to a large embolus over the level of C6, there must have been many small emboli which occluded the other collateral blood supply, or

there may have been progressive thrombus formation from the site of a previous large embolus. This accounted for the attack a few days after the arm pain which might be radicular pain from a large embolus. Besides, the involvement of the posterior column and brain stem was also noted from study of somatosensory evoked potential and auditory brain stem evoked potential, which showed mild dysfunction. Again they were caused by multiple small emboli. Only 33.3% of cases with occlusive lesions of the anterior spinal artery had motor recovery in Dominic and Rossier's (1983). Our patient was discharged after three months of hospitalization with only little improvement in muscle power.

REFERENCES

Dominic F, Rossier AB. Anterior spinal artery syndrome and its natural history. *Paraplegia* 1983; 21 : 1-10.

Haller PR. Infection in intravenous drug abusers. *Postgrad Med* 1988; 83 : 95-115.

Harrington AW. Embolism of the spinal cord. *Glasgow Med J* 1925; 103 : 28-32.

Henery JM. Infarction of the spinal cord, In Stroke: Pathophysology, diagnosis and management. New York: Churchill Livingstone, 1986; pp. 710-4.

Hermans P, Washington J. Polymicrobial bacteremia. *Ann Intern Med* 1970; 73 : 387-92.

Kiani D, Quinn EL, Bruch KH, Madhavan T, Saravolatz LD, Neblett TR. The increasing importance of polymicrobial bacteremia. *JAMA* 1979; 242 : 1044-7.

Lam K, Bayer AS. Serious infection due to group G streptocci, Report of 15 cases with *in vitro-in vivo* correlations. *Am J Med* 1983; 75 : 561-70.

Lazorthes G, Gouaze A, Zadeh JO, Dantini JJ, Lazothes Y, Burdin P. Arterial vascularization of the spinal cord. *J Neurosurg* 1971; 35 : 253-62.

Lerner PI. Neurologic complications of infective endocarditis: Symposium of infections of central nervous system. *Med Clin North Am* 1985; 69 : 385-98.

Osler W. Gulstonian lecures on malignant endocarditis. *Lancet* 1885; 1 : 415, 459, 505.

Reisberg BE. Infective endocarditis in the narcotic addict. *Prog Cardiovasc Dis* 1979; 22 : 193-204.

Robbins JM, Soeiro R, Frishman WH, Strom JA. Right-sided valvular endocarditis : Etiology, diagnosis, and an approach to therapy. *Am Heart J* 1986; 111 : 128-35.

Roselle GA, Watanakunakorn C. Polymicrobial bacteremia *JAMA* 1979; 242 : 2411-4.

Sandson TA, Friedman JH. Spinal cord infarction. *Medicine* 1989; 68 : 282-92.

Saravolatz LD, Buch KH, Quinn EL, Cox P, Madhavan T, Fisher E. Polymicrobial infective endocarditis: An increasing clinical entity. *Am Heart J* 1978; 95 : 163-8.

Tuazon CU, Sheagren JN. Increased rate of carriage of *Staphylococcus aureus* among narcotic addicts. *J Infect Dis* 1974; 129 : 725-7.

Vartian C, Lerner PI, Shlaes DM, Gopalakrishna KV. Infection due to Lancefield Group G streptococci. *Medicine* 1985; 64 : 75-88.

Venezio FR, Gullberg RM, Westenfelder GO, Cook FV. Group G streptococcal endocarditis and bacteremia. *Am J Med* 1986; 81 : 29-34.

Ziment I. Nervous system complications in bacterial endocarditis. *Am J Med* 1969; 47 : 593-607.