

## Malignant Superior Vena Cava Syndrome: Is This a Medical Emergency?

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**Background:** Superior vena cava syndrome (SVCS) is an association with a variety of benign and malignant etiologies. The aim of this study was to evaluate if malignant SVCS is a real medical emergency or if we are able to obtain a definite histological diagnosis before chemoradiotherapy.

**Materials and Methods:** In this prospective case series study, we have evaluated epidemiological characteristics and the ability to obtain a definitive histological diagnosis before chemoradiotherapy and the role of chemoradiotherapy prior to obtaining tissue specimens on the results of diagnostic interventions in patients with malignant SVCS who came to thoracic surgery wards of Imam Khomeini (Tehran) and Ghaem and Imam Reza (Mashhad) hospitals in Iran from 2001 to 2006.

**Results:** Among 50 patients with SVCS, the M/F ratio was 32/18. Mean age was 61.7 years, and the most common symptom was dyspnea (86%). We performed successful tissue sampling before chemoradiotherapy in 44 cases (88%), and histological diagnoses in 100% of these cases were established, but among the other 6 patients (12%) who received chemoradiotherapy first because of unstable general conditions, histological diagnoses were obtained in only one patient (16.7%) after chemoradiotherapy ( $P < 0.01$ ). No in-hospital deaths were reported among our cases.

**Conclusion:** Because we are able to establish tissue specimens by minimally invasive methods in most SVCS cases and because chemoradiation may preclude obtaining an exact pathological diagnosis, we suggest performing diagnostic interventions prior to chemoradiation in patients with SVC syndrome and without emergent clinical conditions. (*Ann Thorac Cardiovasc Surg* 2009; 15: 89–92)

**Key words:** superior vena cava syndrome, chemoradiotherapy, histological diagnosis

### Introduction

The clinical signs and symptoms and radiographic manifestation resulting from compromised blood flow through the superior vena cava (SVC) are easily recognizable and

are referred to as the superior vena cava syndrome (SVCS).<sup>1)</sup>

The SVCS is encountered commonly in association with a variety of benign and malignant etiologies. For malignant etiologies, histological diagnosis is essential

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for the institution of appropriate management.<sup>2)</sup>

Previous medical literature believes that sudden dramatic occlusion of the SVC and the azygos system will result in so-called wet brain syndrome with a development of cerebral edema secondary to venous obstruction (Effler and Groves, 1962).<sup>3)</sup>

Roswit et al. also believes that emergent irradiation with or without chemotherapy is inevitable in this situation, but some authors recently reported very low mortality for SVCS.<sup>4)</sup> So the role of emergent chemoradiotherapy in SVCS has become controversial. On the other hand, however, the establishment of a histological diagnosis is paramount to successful further therapies in SVCS,<sup>5)</sup> and according to a report by Loeffler et al. (1986), prior chemoradiotherapy would reduce the chance of successful pathological evaluations.<sup>6)</sup>

In this study we decided to evaluate if SVCS is a real medical emergency or if we are able to obtain a definite histological diagnosis before chemoradiotherapy.

## Materials and Methods

In this prospective case series study, 50 patients with signs and symptoms of SVC syndrome who came to thoracic surgery wards of Imam Khomeini (Tehran) and Ghaem and Imam Reza (Mashhad) hospitals in Iran from 2001 to 2006 were enrolled. Epidemiological and clinical characteristics of the patients, including age, sex, and clinical manifestations, were analyzed, and the chance to obtain a definite histological diagnosis before and after chemoradiotherapy was evaluated. The results of histopathological studies were then compared in patients who underwent diagnostic interventions prior to chemoradiotherapy with those who had first received chemoradiation.

Statistical analyses were done, using SPSS ver. 11.5, descriptive studies were performed, and analyses were accomplished by using Fisher's exact test.

## Results

Of the 50 patients with SVCS, 32 were male and 18 were female. The mean age was  $61.7 \pm 12.32$  years (range 11 to 75 years).

All patients complained from SVC syndrome symptoms, and the most common symptoms were dyspnea, coughing, and facial edema observed in 86%, 86%, and 82%, respectively, of the total cases. The frequencies of other signs and symptoms of SVCS are shown in Table 1.

We performed tissue diagnostic interventions (includ-

**Table 1. Frequency of signs and symptoms of SVCS**

Signs and symptoms	Frequency (percentage)
Dyspnea	43 (86%)
Cough	43 (86%)
Facial edema	41 (82%)
Upper trunk edema	40 (80%)
Facial plethora	36 (72%)
Distended neck veins	31 (62%)
Distended chest veins	27 (54%)
Arm edema	25 (50%)
Headache	(20%)
Dizziness	(18%)
Hoarseness	(18%)
Stridor	(6%)
Confusion	(4%)

ing lymph node biopsy, bronchoscopic transbronchial biopsy, transthoracic needle biopsy [TTNB], and open biopsy by the Chamberlain procedure or minithoracotomy under special anesthetic considerations) in 44 cases before appropriate treatment (chemotherapy or chemoradiotherapy), and a histological diagnosis was established in all 44. Emergent chemoradiotherapy was needed in only 6 cases because of the unstable general conditions and intolerance of diagnostic procedures. Among these patients, a histological diagnosis was obtained in only 1 case after chemoradiotherapy, and we could establish no definitive histological diagnostic specimen in 5 patients.

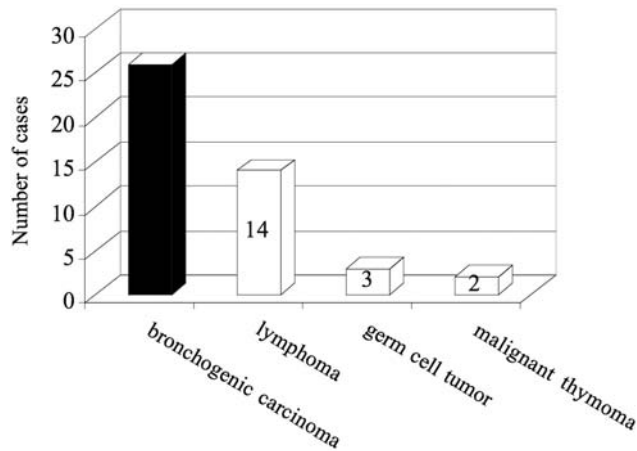
However, we did succeed in establishing histological diagnoses in 100% of those 44 patients in whom biopsy had been taken before appropriate treatment, but in only 1 of the 6 (16.7%) patients that biopsy had been taken after emergent chemoradiotherapy. By comparing these two groups, we found that the difference was significant according to Fisher's exact test ( $P < 0.01$ ).

Among 45 diagnostic pathological reports, 26 (57.8%) were compatible with bronchogenic carcinoma (small-cell lung cancer [SCLC]) in 19 cases and non-SCLC [NSCLC] in 7), which was the most common etiology of SVCS. Lymphoma was reported in 14 cases (31.1%) (12 of non-Hodgkin's lymphoma and 2 of Hodgkin's lymphoma), and germ cell tumor and malignant thymoma were observed in 3 (6.7%) and 2 (4.4%) of patients (Fig. 1).

No in-hospital deaths were reported among the first admissions of our patients in this study.

## Discussion

Superior vena cava syndrome may happen because of



**Fig. 1.** Frequency of etiologies of malignant SVC syndrome.

benign or malignant lesions, but clinical manifestations are initially the same. In this setting, cervical venous pressure usually increases to 20–40 mmHg.<sup>2)</sup> So venous drainage of head and upper extremities and upper trunk will be impaired. Kalra et al. (2003) also described head stuffiness and dyspnea as common clinical presentations of SVCS.<sup>7)</sup> Dyspnea and coughing were common clinical manifestations of SVCS in our series.

Many therapeutic plannings are suggested to control these symptoms. Roswit et al. (1953) believed that unless emergent decompression therapy with X-ray irradiation is applied with or without chemotherapy, death comes finally as a result of cerebral anoxemia, failure of the respiratory center or strangulation, and edema of the glottis and respiratory passage.<sup>4)</sup> But in 2,000 patients with SVCS studied by Ahmann (1984), only one could be found in whom death was directly attributable to SVCS.<sup>5)</sup>

The widely described central nervous system symptoms are in most instances secondary to brain metastases, according to Yellin et al. (1990).<sup>8)</sup> Further, diagnostic procedures to establish a histological diagnosis are paramount to successful therapy. Temporizing emergency mediastinal radiation therapy is not only unwarranted in most cases, as just described, but it could also preclude proper histological interpretation. Loeffler et al. (1986) reported that 8 of 19 patients (42%) were unable to have histological diagnoses established at the time of biopsy because of previous radiation therapy.<sup>6)</sup> Therefore they suggested postponing chemoradiotherapy until diagnostic interventions were completed.

We performed tissue sampling before chemoradiotherapy in 44 cases, and histological diagnoses were established in 100% of them, but among the other 6

patients who received chemoradiotherapy first, histological diagnoses were obtained in only 1 (16.7%) ( $P < 0.01$ ). Also according to our results, emergent chemoradiotherapy would significantly decrease the chance of histological diagnosis.

Among the most common etiologies of malignant SVCS was bronchogenic carcinoma (57.8% in our study), SCLC being the predominant pathology. Lymphoma, especially the NHL type, was another highly common etiology (31.1%). Germ cell tumor and malignant thymoma were lesser etiologies.<sup>9)</sup>

Lee-Elliott et al. reported malignant etiology in 75% of his SVCS series. He also suggested that a new approach include endovascular biopsy followed by immediate stenting in the management of SVCS obstructive complications.<sup>9)</sup>

Several approaches are introduced for the treatment of SVCS that are used mostly in benign pathologies with chronic symptoms, but rarely in malignant disease with acute manifestations. For example, reconstruction of the superior vena cava using an expanded polytetrafluoroethylene (PTFE) prosthesis was reported by Magnan et al. (1994)<sup>10)</sup> and Chiou et al. (1990).<sup>11)</sup> An SVC bypass operation was performed with a composite spiral vein graft constructed from the patient's own saphenous vein.<sup>12)</sup>

According to recent promotions in endovascular surgery, some new therapeutic methods are introduced also for malignant SVCS, such as endoscopic dilatation of superior vena cava obstruction (SVCO) with expandable wire stents that resulted in immediate and complete remission of the SVCO symptoms, which was also reported by Lindström et al.<sup>13)</sup> Percutaneous transluminal revascularization was done by Schifferdecker et al.,<sup>14)</sup> and stent implantation and recanalization of superior vena cava using a polytetrafluoroethylene-covered Z stent was used by Dendo et al.<sup>15)</sup> and Ferro et al.<sup>16)</sup> Thus the establishment of exact histological diagnoses prior to therapeutic interventions would help in planning the best approach for patients. In our study we used no endovascular procedures in our cases.

## Conclusion

Although only a few patients need chemoradiation prior to tissue sampling because of emergent clinical conditions, we are able to establish tissue specimens by minimally invasive methods in most SVCS cases and because chemoradiation may preclude obtaining exact pathological diagnosis. So we suggest performing diag-

nostic interventions prior to chemoradiation in patients with SVC syndrome without emergent clinical conditions.

## References

1. Wudel LJ Jr, Nesbitt Jc. Superior vena cava syndrome. *Curr Treat Options Oncol* 2001; **2**: 77–91.
2. Markman M. Diagnosis and management of superior vena cava syndrome. *Cleve Clin J Med* 1999; **66**: 59–61.
3. Effler DB, Groves LK. Superior vena caval obstruction. *J Thorac Cardiovasc Surg* 1962; **43**: 574.
4. Roswit B, Kaplan G, Jacobson HG. The superior vena cava obstruction syndrome in bronchogenic carcinoma; pathologic physiology and therapeutic management. *Radiology* 1953; **61**: 722–37.
5. Ahmann FR. A reassessment of the clinical implications of the superior vena caval syndrome. *J Clin Oncol* 1984; **2**: 961–9.
6. Loeffler JS, Leopold KA, Recht A, Weinstein HJ, Tarbell NJ. Emergency prebiopsy radiation for mediastinal masses: impact on subsequent pathologic diagnosis and outcome. *J Clin Oncol* 1986; **4**: 716–21.
7. Kalra M, Gloviczki P, Andrews JC, Cherry KJ Jr, Bower TC, et al. Open surgical and endovascular treatment of superior vena cava syndrome caused by nonmalignant disease. *J Vasc Surg* 2003; **38**: 215–23.
8. Yellin A, Rosen A, Reichert N, Liberman Y. Superior vena cava syndrome. The myth—the facts. *Am Rev Respir Dis* 1990; **141**: 1114–8.
9. Lee-Elliott CE, Abubacker MZ, Lopez AJ. Fast-track management of malignant superior vena cava syndrome. *Cardiovasc Intervent Radiol* 2004; **27**: 470–3.
10. Magnan PE, Thomas P, Giudicelli R, Fuentes P, Branchereau A. Surgical reconstruction of the superior vena cava. *Cardiovasc Surg* 1994; **2**: 598–604.
11. Chiou GT, Chen CL, Wei J, Hwang WS. Reconstruction of superior vena cava in invasive thymoma. *Chest* 1990; **97**: 502–3.
12. Doty DB. Bypass of superior vena cava: Six years' experience with spiral vein graft for obstruction of superior vena cava due to benign and malignant disease. *J Thorac Cardiovasc Surg* 1982; **83**: 326–38.
13. Lindström F, Lunderquist A, Jakobsson P. Endoprosthetic dilatation of the vena cava eliminates obstruction in superior vena cava syndrome. *Lakartidningen* 1991; **88** (1–2): 52–4.
14. Schifferdecker B, Shaw JA, Piemonte TC, Eisenhauer AC. Nonmalignant superior vena cava syndrome: pathophysiology and management. *Catheter Cardiovasc Interv* 2005; **65**: 414–6.
15. Dendo S, Inaba Y, Arai Y, Matsueda K, Aramaki T, et al. Severe obstruction of the superior vena cava caused by tumor invasion. Recanalization using a PTFE-covered Z stent. *J Cardiovasc Surg (Torino)* 2002; **43**: 287–90.
16. Ferro C, Scarrone A, Borrelli M, Buccheri G, Ferrigno D, et al. Treatment of superior vena cava syndrome by metal stents. Preliminary experience. *Radiol Med* 1995; **90**: 457–62.