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Pulmonary Embolism after Gynecologic Surgery : Early Detection by Pulse Oximetry and Risk Factors of Pulmonary Embolism

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Abstract : The occurrence of pulmonary embolism after gynecologic surgery without prophylaxis for deep venous thrombosis was investigated. The medical records of 533 consecutive patients, from January 1996 through August 1998, who underwent gynecologic surgery lasting more than 30 minutes, were retrospectively reviewed. Pulmonary embolisms developed in 15 (2.8%) of the 533 patients. Fourteen (93%) of the 15 patients suffered from pulmonary embolism in the first three postoperative days. Five (33%) of the 15 patients had symptoms related to pulmonary embolism; however, 10 (67%) did not show any symptoms. The clue to pulmonary embolism in the asymptomatic patients was just a decrease in oxygen saturation detected by pulse oximetry. No patient died of pulmonary embolism. The patients who developed pulmonary embolism were significantly older, more obese, underwent a longer operation, had a greater blood loss, and received more lymph node dissections ($P<0.01$), in comparison to those who did not develop pulmonary embolism. Our findings showed that pulmonary embolism was not rare in patients who underwent gynecologic surgery without any prophylaxis. Pulse oximetry was useful for detecting asymptomatic pulmonary embolism. Aged and obese patients who underwent longer operations were at an increased risk of developing pulmonary embolism.

Key words : Gynecologic surgery, Postoperative complication, Pulmonary embolism, Pulse Oximetry

Introduction

Postoperative pulmonary embolism is rare but sometimes causes significant morbidity and mortality.[1)–4)] Pulmonary embolism after gynecologic surgery, as compared with that after orthopedic surgery, has so far not attracted much attention. However, since seven patients developed pulmonary embolism after uneventful gynecologic surgery during an 8-month period at our hospital, we retrospectively studied pulmonary embolism after gynecologic surgery.

Patients and Methods

The medical records of consecutive patients who underwent gynecologic surgery lasting more than 30 minutes at National Kyushu

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Cancer Center during the period January 1996 through August 1998 were retrospectively reviewed. Age, body weight, height, duration of surgery, intraoperative blood loss, malignancy, lymph node dissection, obesity, hypertension, and diabetes mellitus of each patient were specifically noted. Obesity was defined as a body weight of more than 121% of an ideal body weight.

A diagnosis of pulmonary embolism was made based on clinical symptoms, pulse oximetry, chest radiography, and pulmonary perfusion scan. We thought that a perfusion defect of larger than an abnormality shown on chest radiography was important in making a diagnosis of pulmonary embolism, as suggested by Biello et al.[2] The symptoms and signs, the day of onset of pulmonary embolism, and outcomes of patients with pulmonary embolism were also studied.

All continuous variables are expressed as mean±SD. Mann-Whitney U-, chi-square, or Fisher's exact tests were used where appropriate. A P value less than 0.05 was considered statistically significant.

Results

During the period studied, 533 patients were operated on. No patient received any prophylaxis for deep venous thrombosis. Pulmonary embolism was suspected and pulmonary perfusion scan was performed in 17 patients. Since a small perfusion defect in the apical region remained unchanged after an improvement in the arterial blood gas values in two patients, they were excluded from further analyses. The remaining 15 patients (2.8%) were thus analyzed as suffering from pulmonary embolisms. Neither an echocardiogram nor pulmonary angiography was performed in these 15 patients. Pulmonary ventilation scan and helical computed tomography were not available at our hospital at that time.

As shown in Table 1, the patients who developed pulmonary embolism were older, more obese, underwent a longer operation, and had a greater blood loss ($P<0.05$ or $P<0.01$), in comparison to those who did not have pulmonary embolism. Five (33%) of the 15 patients had symptoms related to pulmonary embolism, such as dyspnea, chest pain, dizziness, and discomfort. The remaining 10 patients (67%) were symptomless. The only clue to pulmonary embolism was a decrease in oxygen saturation to 85-95%, which was detected by pulse oximetry; thereafter, they underwent a pulmonary perfusion scan. Pulmonary embolism developed in eight patients on postoperative day 1, five on postoperative day 2, one on postoperative day 3, and one on postoperative day 10. As a result, 93% of the pulmonary embolisms developed in the first three postoperative days.

As shown in Table 2, although the rate of pulmonary embolism in patients with malignancy, as compared to those with benign diseases, was 2.7 times higher, this rate was not statistically significant. However, among patients with malignancy, pulmonary embolism developed at a significantly higher rate in those who had a lymph node dissection ($p<0.01$). A significantly higher rate of pulmonary embolism was also noted in obese patients ($P<0.01$). Hypertension or diabetes mellitus did not show a significant influence on the development of pulmonary embolism.

Table 1. Risk factors for pulmonary embolism

Variables	Pulmonary Embolism Yes (n=15)	Pulmonary Embolism No (n=518)	P value
Age (years)	59.9±11.2	49.9±13.3	<0.01
Body Weight (kg)	59.5±11.5	53.2±7.7	<0.05
Body Height (cm)	153.3±7.3	154.4±5.7	NS
Duration of Surgery (min)	249.1±93.2	184.9±94.1	<0.01
Blood loss (ml)	654.3±600.4	361.0±506.7	<0.01

Numerical data are expressed as the mean±SD. NS=not significant.

Table 2. Pulmonary embolism with respect to other diseases

	Number of patients	Number of patients with pulmonary embolism	%	P value
Current disease				
Benign	213	3	1.4	
Malignancy	320	12	3.8	NS
Lymph node dissection				
Yes	188	12	6.4	<0.01
No	132	0	0	
Concurrent disease				
Obesity	134	10	7.5	<0.01
Hypertension	80	5	6.3	NS
Diabetes mellitus	36	3	8.3	NS

NS=not significant.

All the patients who developed pulmonary embolism were treated with heparin or low molecular weight heparin and, except for one patient, all improved rapidly. The patient with delayed improvement had deep venous thrombosis and repeated pulmonary embolisms, and needed lengthy hospitalization. No patients died of pulmonary embolism.

Discussion

Since pulmonary embolism cannot definitely be diagnosed solely by chest radiography or pulmonary perfusion scan,[3] but because our patients could not be examined by either pulmonary angiography or a helical computed tomography scan of the lungs, we made a diagnosis of pulmonary embolism based on the clinical symptoms, pulse oximetry, chest radiography, and pulmonary perfusion scan. Specifically, we adopted Biello et al's criteria for pulmonary embolism, which holds that there is an 87% probability of pulmonary embolism when there is a perfusion defect larger than that of abnormality on chest radiography.[2]

Deep venous thrombosis precedes pulmonary embolism, with the highest incidence of pulmonary embolism occurring after hip and knee arthroplasty. Without any prophylaxis, deep venous thrombosis is demonstrated in more than 50%, and a fatal pulmonary embolism occurs in 0.5% to 2% after hip and knee arthroplasty.[4] Deep venous thrombosis and pulmonary embolism after gynecologic surgery does not attract much attention, compared to that occurring after hip or knee arthroplasty. Deep venous thrombosis after gynecologic surgery occurs in 6.2% to 37.9% of patients.[1] A recent survey of postoperative pulmonary embolism in Japan showed that the number of patients who suffered from pulmonary embolism following gynecologic surgery was the second highest after general surgery.[5] A death rate of 1.4% due to pulmonary embolism after gynecologic surgery has been reported,[6] and it is responsible for as many as 40% of all deaths after gynecologic operations.[1] No fatal pulmonary embolism was observed in our patients.

Risk factors for postoperative deep venous thrombosis and pulmonary embolism are an advanced age, obesity, longer operation, excessive blood loss, malignancy, history of deep venous thrombosis, edema and varicose veins in the lower limbs, the use of contraceptive pills, and estrogen replacement therapy.[6)–8] Our findings showed that patients who developed pulmonary embolism were significantly older, more obese, had more blood loss and lymph node dissection, than those who did not develop pulmonary embolism. These findings are in accordance with other reports.[1)6)–8] As patients with malignancy tend to develop deep venous thrombosis because of their hypercoagulable state due to tumor cells, vessel wall injuries, and platelet abnormalities,[7] they are at risk of pulmonary embolism.[1)6)] In our patients, the rate of pulmonary embolism in those with malignancy was 2.7 times higher than in those with benign diseases. However, the difference was not statistically significant.

The most frequent symptom noted in 309 patients with pulmonary embolism was dyspnea,[9] which was noted in 66% of the patients, with the next most common symptom being chest pains, which occurred in 46% of the patients. In this report, 36% of the patients were in cardiogenic shock,[9] suggesting that there were many patients with severe pulmonary embolism. Meanwhile, 10 (67%) of our 15 patients with pulmonary embolism were asymptomatic. The only clue to the development of pulmonary embolism in these patients was a decrease in oxygen saturation as detected by pulse oximetry. This suggests that postoperative monitoring with pulse oximetry, which is non-invasive, is useful for detecting the onset of asymptomatic pulmonary embolism.

In conclusion, pulmonary embolism was not rare in patients who underwent gynecologic surgery without any prophylaxis for deep venous thrombosis. Pulmonary embolism developed more frequently in patients who were older, more obese, underwent a longer operation, and had a lymph node dissection. A decrease in oxygen saturation was therefore the only clue to the development of asymptomatic pulmonary embolism.

References

1) Davis, J. D.: Prevention, diagnosis, and treatment of venous thromboembolic complications of gynecologic surgery. Am. J. Obstet. Gynecol., 184 : 759–775, 2001.

2) Biello, D. R., Mattar, A. G., McKnight, R. C. and Siegel, B. A.: Ventilation-perfusion studies in suspected pulmonary embolism. Am. J. Roentgenol., 133 : 1033–1037, 1979.

3) Goldhaber, S. Z.: Pulmonary embolism. N. Engl. J. Med., 339 : 93–104, 1998.

4) Lieberman, J. R. and Geerts, W. H.: Prevention of venous thromboembolism after total hip and knee arthroplasty. J. Bone Joint Surg., 76A : 1239–1250, 1994.

5) Sha, M., Ikeda, M. and Tanifuji, Y.: Perioperative pulmonary embolism: a nationwide survey in Japan. Masui, 48 : 1144–1149, 1999.

6) Clarke-Pearson, D., Jelovsek, F. R. and Creasman, W. T.: Thromboembolism complicating surgery for cervical and uterine malignancy: incidence, risk factors, and prophylaxis. Obstet. Gynecol., 61 : 87–94, 1983.

7) Piccioli, A., Prandoni, P., Ewenstein, B. M. and Goldhaber, S. Z.: Cancer and venous thromboembolism. Am. Heart J., 132 : 850–855, 1996.

8) Grodstein, F., Stampfer, M. J., Goldhaber, S. Z., Manson, J. E., Colditz, G. A., Speizer, F. E., Willett, W. C. and Hennekens, C. H.: Prospective study of exogenous hormones and risk of pulmonary embolism in women. Lancet, 348 : 983–987, 1996.

9) Nakamura, M., Fujioka, H., Yamada, N., Sakuma, M., Okada, O., Nakanishi, N., Miyahara, Y., Kuriyama, T., Kunieda, T., Sugimoto, T., Nakano, T.: Clinical characteristics of acute pulmonary thromboembolism in Japan: results of a multicenter registry in the Japanese Society of Pulmonary Embolism Research. Clin. Cardiol. 24 : 132–138, 2001.

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