



Original article

Current status of the use of inferior vena cava filters in cases of pulmonary embolism in CCUs: From the Tokyo CCU Network



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ABSTRACT

Objective: To elucidate the current status of use of inferior vena cava filters (IVCFs) in cases of pulmonary embolism at institutions belonging to the Tokyo CCU Network.

Methods: We conducted a retrospective investigation of 832 consecutive cases of pulmonary embolism reported on survey forms to the Tokyo CCU Network between 2005 and 2010.

Results: Of 832 cases of pulmonary embolism, IVCFs were used in 338 (40.6%) and not used in 415 (49.9%). Their use was unclear in 79 (9.5%) cases. The use rate gradually increased each year from 2005 until 2008 but decreased from 2009 onward. Moreover, 68.9% of the IVCFs used in cases were non-permanent types. In terms of pulmonary embolism severity, the rate of use was 37.2% in non-massive cases, 49.4% in sub-massive cases, 46.9% in massive cases, and 31.9% in collapse cases. Thirty-day mortality in cases of collapse in which IVCFs were not used was extremely high at 75.8%, suggesting that in many cases, rapid deterioration may occur with insufficient time for IVCF insertion. The differences in IVCF usage rate among institutions were large in the range of 12.5–90% from 2005 to 2008, which slightly declined to the range of 25.0–72.2% from 2009 to 2010.

Conclusions: We elucidated the current IVCF use status in cases of pulmonary embolism at institutions belonging to the Tokyo CCU Network. Since the status of use differed among institutions, future studies of effective methods of use are required.

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Introduction

Pulmonary embolism causes circulatory disturbances due to obstruction of the pulmonary artery, and possible obstructions include clots, air, fat, and tumors, although embolization is caused by deep vein thrombosis in the legs or pelvis in >90% of cases. Acute pulmonary embolism is increasing in Japan and mortality rates are currently 14% [1,2], so there is public demand for the appropriate management of pulmonary embolism.

“The Guidelines for the Prevention of Pulmonary Thromboembolism/Deep Vein Thrombosis” were produced for the first time in Japan in 2004 [3]. In 2009, the Japanese Circulation Society published the “Guidelines for the Diagnosis, Treatment, and Prevention of Pulmonary Thromboembolism and Deep Vein Thrombosis (2009 revised edition)” [4]. According to these guidelines, standard

treatment focuses on physical therapies such as early ambulation, elastic stockings, and intermittent pneumatic compression with the combined use of anticoagulant therapy for high-risk patients, and these treatments that prevent pulmonary embolism are currently covered by health insurance. The synthetic Xa inhibitor fondaparinux, which was formerly covered by health insurance only for the preventive application to high-risk patients in the peri-operative period, has also been approved for the treatment of deep vein thrombosis since March 2011. The prevention and treatment of venous thrombosis is thus making strides and public awareness of it is also high. Despite this, the number of cases of deep venous thrombosis shows no sign of declining. Measures to prevent serious pulmonary embolism when deep venous thrombosis occurs are therefore required.

Inferior vena cava filters (IVCFs) are considered effective devices for preventing the occurrence/recurrence of pulmonary thromboembolism by preventing deep vein thrombosis from entering the pulmonary artery after it has become detached. However, their effectiveness has only been investigated in a single randomized trial, the PREPIC Study [5], and the evidence is still insufficient. The only multicenter survey of their status of use in Japan was that

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of Yamada et al. [6], which dates back to 2001, before the use of retrievable IVCFs became widespread, and the current situation is envisaged to be different.

The objective of this study was to elucidate the current status of IVCF use in cases of pulmonary embolism at cardiac care units (CCUs) in 62 institutions belonging to the Tokyo CCU Network.

Materials and methods

The study was performed using data from the Tokyo CCU Network. The Tokyo CCU Network is operated through 62 hospitals with the help of ambulance units through the control room of the Tokyo Fire Department. Institutions belonging to the Tokyo CCU Network routinely record and submit details of all patients treated in their CCUs on survey forms [1]. In this study, subjects comprised a continuous series of 832 cases (350 males, 482 females; average age, 64.5 ± 16.0 years) treated at institutions belonging to the Tokyo CCU Network between January 2005 and December 2010, and the use of IVCFs was evaluated on the basis of these survey forms.

Seven hospitals that treated a large number of cases of pulmonary embolism were asked to complete an additional survey regarding the presence or absence of deep vein thrombosis and the status of IVCF use.

Statistical comparisons of continuous variables were performing using Student's *t*-test or the Mann–Whitney *U* test as appropriate. Statistical comparisons of dichotomous variables were carried out using the chi-squared test. The values of $p < 0.05$ were considered statistically significant.

Results

Status of IVCF use

IVCFs were used in 40.6% (338 cases) of the total 832 cases of pulmonary embolism treated in CCUs (Fig. 1-1).

Changes over time in IVCF use rate

The IVCF use rate gradually increased from 45.0% in 2005 to 52.3% in 2008 and then reversed and fell to 37.1% in 2009 and 34.1% in 2010. This is an extremely noteworthy trend that will be discussed further below (Fig. 1-2).

IVCF types used

Non-permanent IVCFs accounted for the majority, 68.9%. Since the survey forms used from 2005 until early 2009 made no distinction between retrievable filters and temporary filters among the non-permanent filters, it is unclear which type was used more often. Therefore, we revised the survey form to make this distinction after mid-2009 (Fig. 1-3).

State of IVCF use by pulmonary embolism severity

The pulmonary embolism severity among these 832 cases was classified as non-massive (no signs of right heart load) in 331 cases (39.8%), sub-massive (right heart load present but no shock) in 261 (31.4%), massive (right heart load and shock) in 81 (9.7%), and collapse (cardiopulmonary arrest, pulseless electric activity or other circulatory collapse) in 47 (5.6%). The IVCF used in each category was then evaluated (although severity was unknown in 79 cases). As shown in Fig. 2, the use rate increased in the order of non-massive (37.2%) < sub-massive (49.4%), and massive (46.9%), but it was low in cases of collapse (31.9%).

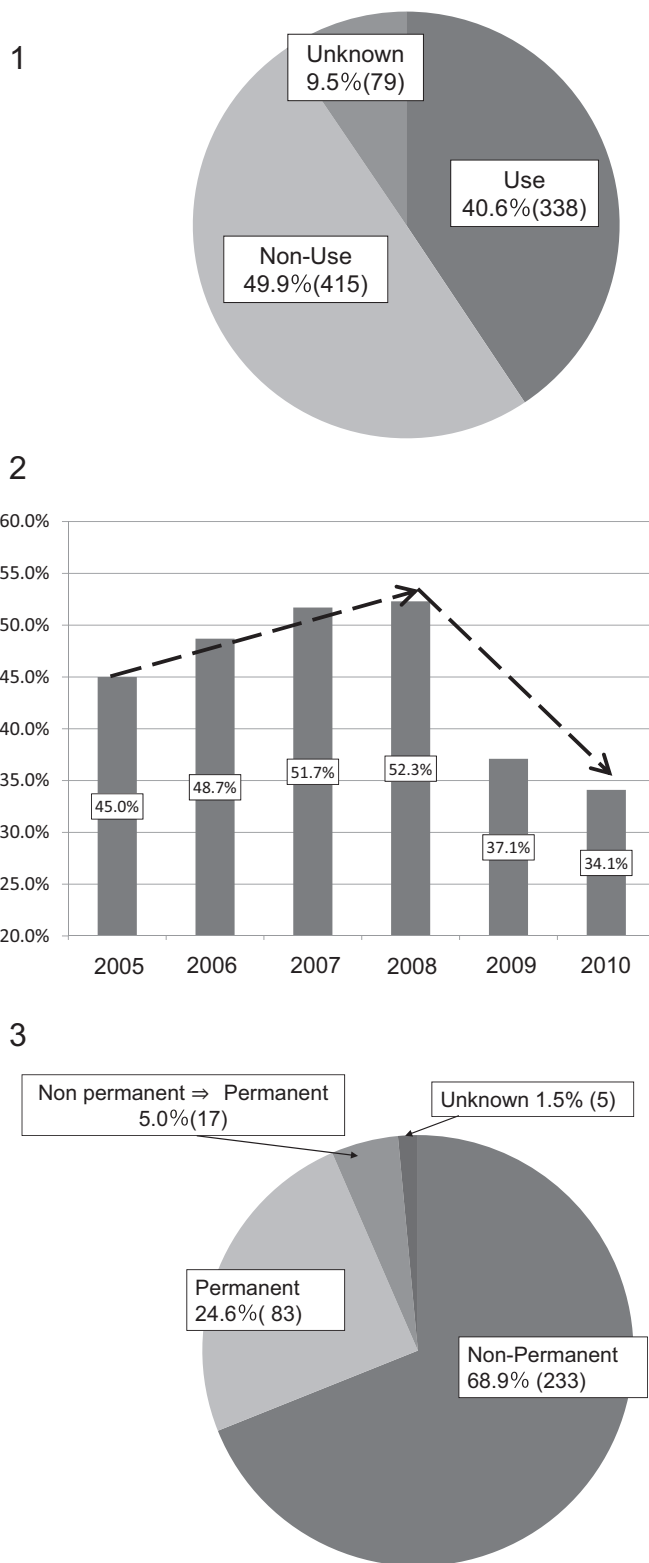


Fig. 1. (1) Inferior vena cava filters were used in 338 (40.6%), not used in 415 (49.9%), and unknown in 79 (9.5%) cases. (2) The use rate gradually increased from 2005 to 2008 and decreased after 2009. (3) Non-permanent inferior vena cava filters were used in 68.9% of cases.

Relationship between IVCF use by severity and acute mortality

Thirty-day mortality in cases of collapse in which IVCFs were not used was high at 75.8%, and it was significantly higher than that of patients for whom IVCFs were used (20.0%) ($p = 0.0009$). The

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