Of 18,365 patients who underwent coronary angiography with a 4F or 5F universal catheter between April 2004 and May 2007, 24 (0.131%) experienced sustained ventricular tachycardia or ventricular fibrillation during the procedure. There was no significant difference in any clinical or angiographic characteristic between patients who had a ventricular arrhythmia and those who did not. Of the 24 episodes of ventricular arrhythmia, 14 were related to catheter manipulation, 8 to ischemia, and 2 to the contrast medium, while the cause could not be clearly established in 4. The incidence of ventricular arrhythmia with a universal catheter was 0.131%, and with a preformed catheter, 0.054% (P = .72). The study shows that serious ventricular arrhythmia occurs only rarely as a complication when coronary angiography is carried out using modern techniques and that imperfect manipulation of the catheter explains most episodes.

Key words: Ventricular arrhythmia. Coronary angiography. Universal catheter.
RESULTS

Among 18,365 patients undergoing CA using 5F or 4F universal catheter, ventricular tachycardia (VT) or ventricular fibrillation (VF) was documented in 24 patients (0.131%, 15 VF and 9 VT); VA developed during right coronary artery (RCA) procedures in 18 patients, left coronary artery (LCA) procedures in 5 patients, and after procedure in 1 patient.

Among 24 VA patients, 13 VF patients received defibrillation within 1 minute and successfully returned to sinus rhythm; 1 VF patient returned to sinus rhythm after an attempt version. Ten patients experienced nonsustained VT, lasting more than 2 seconds. All VA patients didn’t have prior history of malignant arrhythmia and were discharged alive without complications or reoccurrence of VA during hospitalization.

Table 1 lists the basic clinical and coronary angiographic characteristics of the VA and non-VA patients. Our data showed that there wasn’t significant difference between the 2 groups.

The possible causes of VA are showed in Table 2. Most VAs were manipulation-related.

The incidence of VA are in 5F universal (Judkins and Amplatz) and non-universal catheters (TIG, BRACHIAL and MITSUDO-K40) were 0.131% (24/18346) and 0.054% (1/1837) (P = .72).

DISCUSSION

In our data, the incidence of VA during CA using 5F or 4F universal catheter was lower than previous studies. New nonionic contrast agents lowered the incidence of VF; a smaller size catheter can reduce the incidence of catheter occlusion, and it also tends to reduce the volume of contrast material injections as well. We consider that these contribute mainly to the decreased incidence.

Similar to previous studies, the episode of VA was more frequent during RCA procedures than LCA procedures. In our data, there was no episode of VA during vein bypass grafts procedures, which was different from previous reports; we considered that the lower incidence of VA occurrence, small sample, and the use of smaller size catheter could contribute to the observed difference between the present study and previous reports. After a comparison of VA and no-VA patients, we didn’t find any clinical and angiographic characteristics that predicted the episodes of VA; but a trend was noted toward more frequent episodes of VA in 3-vessel disease patients. As a result of retrospective analysis, our conclusion should be tested by a large prospective randomized study.

The causes of VA during CA had been described previously. Early reports suggested that, although VA could be caused by ischemia or mechanical complications, almost all VAs were associated with contrast medium toxicity. In our data, most episodes of VA were manipulation-related. We speculated that the use of small size and universal catheter could contribute mainly to this change.

Acute ischemia was another important cause that was related to the episodes of VA in our study. Transient ischemia is common and often manipulation-induced (catheter occlusion, catheter stimulation, and long injection) during CA procedures. How to decrease ischemia is also an important consideration for reducing the possibility of VA, especially in the patients with a severe coronary artery disease. In our data, only 2 episodes of VA were contrast-related. We considered that contrast medium toxicity was not mainly cause of VA attack after use of new nonionic contrast medium and small size catheter.

VA might occur without warning; it was not always so easy to analyze the specific causes and its relation of each CA procedure. Ischemia and contrast medium could
Although there was no significant difference in incidence of VA between universal and non-universal catheters, universal catheters tended to have more frequent episodes of VA than non-universal catheters. According to our experience, it was easier and more frequent to obtain good coaxiality and backing out of RCA during vigorous injection with a JR catheter than with universal catheters. The universal catheters with long-tip are not especially designed for right or left coronary artery, so it is easier to perform a superselective (often conus branch) or deep intubation. It is well known that VA often occurs during intracoronary rapid flush of contrast medium on the condition of superselective or deep intubation. In addition, a small size catheter with excessive engagement and a poor coaxiality could lead to a vessel dissection following a sudden and forceful injection.

In summary, with the use of new nonionic contrast and 5F universal catheter, VAs are infrequent and most episodes of VA are manipulation-related. Mainly procedural details to reduce the possibility of VA include avoidance of superselective or deep intubation in RCA angiography; avoidance of a rapid flash of contrast medium injection when the tip position of a catheter is

<table>
<thead>
<tr>
<th>Possible Causes of VA</th>
<th>VA (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulation-related VA</td>
<td>14</td>
</tr>
<tr>
<td>Catheter superselective intubation</td>
<td>9</td>
</tr>
<tr>
<td>Catheter deep intubation</td>
<td>2</td>
</tr>
<tr>
<td>Catheter occlusion</td>
<td>2</td>
</tr>
<tr>
<td>Catheter stimulation</td>
<td>1</td>
</tr>
<tr>
<td>Ischemia-related VA</td>
<td>8</td>
</tr>
<tr>
<td>Contrast-related VA</td>
<td>2</td>
</tr>
<tr>
<td>Unclear causes</td>
<td>4</td>
</tr>
</tbody>
</table>

Although there was no significant difference in incidence of VA between universal and no-universal catheters, universal catheters tended to have more frequent episodes of VA than non-universal catheters. According to our experience, it was easier and more frequent to obtain good coaxiality and backing out of RCA during vigorous injection with a JR catheter than with universal catheters. The universal catheters with long-tip are not especially designed for right or left coronary artery, so it is easier to perform a superselective (often conus branch) or deep intubation. It is well known that VA often occurs during intracoronary rapid flush of contrast medium on the condition of superselective or deep intubation. In addition, a small size catheter with excessive engagement and a poor coaxiality could lead to a vessel dissection following a sudden and forceful injection.
unclear, paying more attention on severe coronary artery diseases patients and avoidance of a slow prolonged contrast medium injection or catheter occlusion in these patients.

REFERENCES