Central Venous Access Port-related Complications in Outpatient Chemotherapy for Colorectal Cancer

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Received May 8, 2007; accepted August 2, 2007; published online December 4, 2007

Background: The current standard chemotherapy for advanced or metastatic colorectal cancer in Japan is FOLFOX or FOLFIRI therapy. Although both therapies include continuous infusion of 5-fluorouracil (5-FU), outpatient home chemotherapy is possible by placing a central venous access port (CV-port) and using a portable disposable pump. The port system has been placed more frequently since the approval of FOLFOX. Consequently, more complications involving ports and pumps have been encountered.

Methods: At our hospital, 232 patients with colorectal cancer underwent outpatient home chemotherapy by placing a CV-port and using a portable disposable pump for continuous infusion of 5-FU between 1998 and 2005. Incidence and contents of complications involving ports and pumps were investigated retrospectively.

Results: A total of 54 incidents of complications involving ports and pumps were identified in 3142 treatments (1.72%) from among 34 of the 232 patients (14.7%). In 2005, when FOLFOX was introduced, 31 incidents occurred in 1903 treatments (1.63%) for 19 of 149 patients (12.8%). Incidents involved port placement (n = 6), catheter and port system-related complications (n = 15), puncture needle-related complications (n = 3), skin complications related to tape fixation (n = 20) and pump-related complications (n = 10). In 10 patients (4.3%), system-related complications made therapy difficult to continue and system exchange was required.

Conclusions: Technical troubles involving ports and pumps occurred at a certain rate, and skin incision was required for system exchange in some cases. When performing outpatient chemotherapy using ports and pumps, thorough prior guidance and double-checking must be implemented, and proper countermeasures must be established.

Key words: colorectal cancer — outpatient home chemotherapy — central venous access port — portable disposable pump — complication

INTRODUCTION

As chemotherapy for advanced or metastatic colorectal cancer (CRC), combination therapy consisting of continuous infusion of 5-fluorouracil (5-FU) and isovorin therapy was approved in February 2005 in Japan. In April 2005, FOLFOX therapy combined with oxaliplatin was approved. Currently, the standard therapy for advanced or metastatic CRC in Japan is FOLFOX or FOLFIRI combined with irinotecan (1,2). In recent years, chemotherapy for various cancers has been performed on an outpatient basis, and both FOLFIRI and FOLFOX for the treatment of CRC include 46-h continuous infusion of 5-FU, making this regimen difficult to perform on an outpatient basis. However, outpatient chemotherapy is possible by placing a central venous access port (CV-port) and using a portable disposable pump (3). At our hospital, continuous infusion of 5-FU for the treatment of advanced or metastatic CRC has been performed by placing a CV-port, and outpatient home chemotherapy has been performed more frequently since the approval of FOLFOX. Consequently, more complications involving...
CV-ports and portable disposable pumps have been encountered (4). The present study retrospectively investigated the current state of technical complications involving CV-ports and portable disposable pumps in outpatient home chemotherapy for the treatment of CRC. These technical complications associated with port placement technique, chemotherapy procedure and devices were targeted.

METHODS

At our hospital, a CV-port was placed in a total of 1075 patients between 1998 and 2005. Of these, a port was placed for the treatment of CRC chemotherapy in 296 patients, and continuous infusion of 5-FU was performed using a portable disposable pump at home in 232 patients (Fig. 1). Among these 232 CRC patients who underwent outpatient home chemotherapy, the frequency and contents of complications involving CV-ports and portable disposable pumps were analysed after reviewing medical records.

All 232 patients had advanced or metastatic CRC and underwent all 316 regimens for a total of 3142 times (Table 1).

In 2005, when FOLFOX was introduced, 127 new patients underwent 162 regimens for a total of 1460 times, and 22 patients who were treated in 2004 underwent 16 regimens for a total of 443 times.

In all patients, chemotherapy was started in the outpatient chemotherapy room for drip infusion of agents such as oxaliplatin or irinotecan, and isovorin through a CV-port using a particular puncture needle, then a portable pump containing the necessary amount of 5-FU was connected to infuse the remedy at home. Once 5-FU infusion was completed, patients removed the needle themselves. Patients also received guidance using a written manual from a nurse regarding needle removal and home care. A physician and nurse double-checked the connection between pump and port.

The duration of 5-FU continuous infusion was 24 h in 10 regimens, 44–48 h in 301 regimens and 120 h in 5 regimens.

Table 1. Number of patients receiving all-infusional 5-FU based chemotherapy

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Infusion time of 5-FU (h)</th>
<th>1998–2004</th>
<th>2005</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-Day infusional 5-FU</td>
<td>120</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>F2000</td>
<td>48</td>
<td>61</td>
<td>1</td>
<td>62</td>
</tr>
<tr>
<td>F2000/CDDP</td>
<td>48</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>F2000/LV</td>
<td>48</td>
<td>11</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>F2000 + CPT</td>
<td>48</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>AIO</td>
<td>24</td>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>sLV5FU2</td>
<td>46</td>
<td>20</td>
<td>18</td>
<td>38</td>
</tr>
<tr>
<td>sLV5FU2 + CPT</td>
<td>46</td>
<td>16</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>FOLFIRI</td>
<td>46</td>
<td>12</td>
<td>36</td>
<td>48</td>
</tr>
<tr>
<td>FOLFOX</td>
<td>44/46*</td>
<td>0</td>
<td>112</td>
<td>112</td>
</tr>
</tbody>
</table>

Total: 138 178 316

5-FU, 5-fluorouracil; F2000, a regimen of 5-FU 2000 mg/m2/48 h q2weeks; CDDP, cisplatin as a modulator; LV, luecovorin as a modulator; CPT, combined with irinotecan; AIO, a regimen of infusional 5-FU/LV; sLV5FU2, a regimen of infusional 5-FU/LV; sLV5FU2 + CPT, 1-week alternation of sLV5FU2 and irinotecan; FOLFIRI, combination of sLV5FU2 and irinotecan; FOLFOX, combination of infusional 5-FU/LV and oxaliplatin.

*44 h = 22 h x 2 days in FOLFOX4, 6 h in FOLFOX6 and mFOLFOX6.

A portable pump matching the duration of infusion was used. Patients used an LV10, LV5 or LV2 infuser (Baxter, Deerfield, IL, USA).

In all 232 patients, a CV-port was placed by an interventional radiologist at the time of admission. An indwelling catheter was inserted under diagnostic imaging guidance from either the right or left proximal axillary vein and a port connected to the catheter was placed subcutaneously below the clavicle (5,6). In the first placement, the CV-port comprised a 7F Groshong catheter in 67 patients (MRI low profile port, n = 67) and an 8F Groshong catheter in 165 patients (MRI port, n = 41; Titanium port, n = 13; and X port, n = 111). In 10 cases with 9 patients, the infusion system was replaced, and the CV-port was replaced with a 7F Groshong catheter in 2 cases (MRI low profile port, n = 2), an 8F Groshong catheter in 7 cases (X port, n = 7) and a 5F Anthrone PU catheter in 1 case (Celsite port, n = 1) (Groshong catheter, MRI port, Titanium port and X port: Bard, Salt Lake City, UT, USA) (Anthrone PU catheter: Toray Medical, Tokyo, Japan) (Celsite port: B-Braun, Bethlehem, PA, USA).

RESULTS

Among 34 of the 232 patients (14.7%), a total of 54 incidents involving CV-ports and portable disposable pumps were identified in 3142 treatments (1.72%). In 2005, 31
incidents occurred in 19 of 149 patients (12.8%) with 1903 treatments (1.63%). Incidents involved port placement (n = 6), catheter and port system-related complications (n = 15), puncture needle-related complications (n = 3), skin complaints (n = 12), tape fixation-related complications (n = 8) and pump-related complications (n = 10) (Table 2).

In 10 patients (4.3%), a CV-port-related complication made therapy difficult to continue and system removal, exchange or repair was required in 11 cases (0.35%) (removal or exchange, n = 10; repair only, n = 1).

Table 2. Incidence of complications related to CV-port and pump system

<table>
<thead>
<tr>
<th>Complications related to CV-port and pump system</th>
<th>Number*</th>
<th>Term (d)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port placement procedure-related</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subcutaneous hematoma</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Wound pain with keloid</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>Slight pneumothorax</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Catheter and port system-related</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catheter damage</td>
<td>5</td>
<td>178</td>
</tr>
<tr>
<td>Catheter migration</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Suspected infection</td>
<td>2</td>
<td>119</td>
</tr>
<tr>
<td>Fibrin sheath formation</td>
<td>2</td>
<td>65</td>
</tr>
<tr>
<td>Manually irreparable port reversal</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Manually reparable port reversal</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Skin complain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tape fixation-site skin irritation</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Port-site pain</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Port-site skin damage</td>
<td>1</td>
<td>442</td>
</tr>
<tr>
<td>Puncture-site pain</td>
<td>1</td>
<td>44</td>
</tr>
<tr>
<td>Pruritus</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Tape fixation-related</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Failed fixation</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>Tape removal by itself</td>
<td>3</td>
<td>73</td>
</tr>
<tr>
<td>Puncture needle-related</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecting tube damage</td>
<td>3</td>
<td>32</td>
</tr>
<tr>
<td>Pump-related</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prolonged infusion time</td>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td>Worried air bubbles</td>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td>Reduced infusion time</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Contaminated by foreign bodies</td>
<td>1</td>
<td>73</td>
</tr>
</tbody>
</table>

*Incidence of complications related to CV-port and pump system.
†Median number of days between placement of CV-port and occurrence of complications.

DISCUSSION

In Japan, CV-ports have been used for intravenous hyperalimentation at home (7), and since FOLFOX was approved for treatment of advanced or metastatic CRC, CV-port placement has been performed more often to intravenously administer anticancer agents. Establishing a CV-port and using a portable disposable pump allows continuous infusion of anticancer agents at home (3).

As complications associated with CV-port placement, air embolus, arterial puncture, puncture-site bleeding, arrhythmia, lymph duct damage, nerve damage and erroneous catheter insertion have been reported, and subclavian vein puncture has been known to cause pneumothorax, hemotherax, respiratory damage and mediastinal hematoma. As complications following port placement, indwelling catheter closure and damage, catheter pinch-off, catheter movement, port damage, fibrin sheath formation, vascular occlusion, thrombophlebitis/phlebothrombosis and infection have been described. From the perspective of procedures, puncture needle damage and skin damage associated with drug leakage can occur (4–6,8–11).

FOLFIRI and FOLFOX are becoming the standard treatments for advanced or metastatic CRC in Japan, and outpatient home chemotherapy using a CV-port and a portable disposable pump is becoming more popular. To confirm procedural safety, a retrospective study was conducted on complications related to CV-ports and portable disposable pumps.

In 2005, the number of CRC patients undergoing outpatient home chemotherapy rapidly increased, but the frequency of problems involving CV-ports and portable disposable pumps did not markedly increase. Even before 2004, we provided prior guidance and a double-check system to minimize complications (12,13), but despite these measures, these troubles still occurred at a certain rate, and skin incision was required for system exchange in some cases. As informed consent was obtained before the procedure, patients needed
to be provided with information including that system exchange would be required in principle if system damage and fibrin sheath formation occurred. When performing chemotherapy on an outpatient basis, thorough prior guidance and double-checking must be implemented, and proper countermeasures and a daily management system must be established.

Conflict of interest statement
None declared.

References