into the epidural space, but then we administer top-up
 doses with extra caution, lest the catheter has been
 placed intrathecally, which had indeed occurred in two
 cases as demonstrated by an ability to aspirate a con-
 tinuous flow of spinal fluid.

I wonder if, on the basis of their conjectures, your
 contributors have considered the distribution of blood
 injected for an epidural blood patch? To date, we have
 administered 246 of these in the treatment of head-
 aches, consequent upon either an inadvertent perfora-
 tion or a spinal block, when, by definition, there is a
 hole in the dura. In no such circumstance has there been
 evidence that the blood has reached either the subdural
 space or the cerebrospinal fluid.

Anesthesiology
59:79–80, 1983

Pseudoarterialization of the CVP by an Infusion Pump

To The Editor:—We would like to call attention to a
problem associated with the use of an Abbott/Shaw Life
Care Infusion Pump (Model 8) during induction of
anesthesia in a neurosurgical patient. A 20-gauge needle
attached to the infusion set was inserted through a rub-
ber port in a long-line central venous catheter that dis-
played a normal CVP tracing on our monitor. Shortly
after initiating the infusion of fentanyl at a rate of 300
ml/h, we observed a sudden increase in the CVP from
10 to greater than 60 mmHg. In addition, the config-
uration of the tracing was arterial. We were concerned
that the tip of the catheter had migrated into the right
ventricle. Withdrawal of the catheter did not result in
the return of the previously normal CVP tracing. It also
was noted at this time that the frequency of these newly
observed waves in the CVP tracing appeared to be reg-
ular but was not the same as that of the systemic arterial
pressure waves being monitored simultaneously. Turn-
ing off the infusion pump resulted in the reappearance
of a normal CVP tracing. When the infusion was re-
started, the abnormal tracing reappeared. At this time,
we decided to continue the i.v. infusion of fentanyl, using
a peripheral rather than the central venous access to
avoid further confusion.

A study of the Abbott/Shaw Life Care Pump was
undertaken in vivo to determine the range of pressures
that could be generated in the central venous catheter
at different infusion rates. In a patient with a CVP of
8 mmHg, four sets of measurements, including systolic,
diastolic, and mean pressures, were averaged and are
presented in table 1 along with their corresponding
stroke and infusion rates. Peak systolic and mean pres-
sures are significantly higher than the baseline CVP at
all infusion rates, and all pressures increase gradually
as infusion rates increase. To determine if the pressures
generated by the pump in the tubing could be trans-
mitted to the central circulation, a double lumen pul-
monary artery catheter was modified by removing about
30 cm of length distal to the proximal (CVP) port, and
was inserted into the central venous circulation. No al-
terations in the CVP tracing monitored distally were
observed during infusion of fluid through the proximal
port at a rate of 400 ml/h. The system operating man-
ual of the Abbott/Shaw Life Care Pump states that the
pressure at the tip of the needle remains essentially sim-
ilar to that within the cannulated vein, regardless of the
pressure developed within the set, pump chamber, and
tubing. In view of our findings, we feel that this infor-
mation is accurate. The high pressures measured in the
CVP catheter result from the rapid acceleration of small
quantities of fluid by the pump mechanism. It appears
that these pressure waves are attenuated almost instan-
taneously after exiting the infusion set tubing and nee-

Table 1. Pressures Generated by the Abbott/Shaw Life Care
Pump at Various Infusion Rates in One Patient
with a CVP of 8 mmHg

<table>
<thead>
<tr>
<th>Infusion (ml/h)</th>
<th>Strokes (no./min)</th>
<th>Systolic (mmHg)</th>
<th>Diastolic (mmHg)</th>
<th>Mean (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3</td>
<td>59</td>
<td>14</td>
<td>29</td>
</tr>
<tr>
<td>20</td>
<td>5</td>
<td>63</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>40</td>
<td>10</td>
<td>63</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>100</td>
<td>24</td>
<td>66</td>
<td>16</td>
<td>33</td>
</tr>
<tr>
<td>200</td>
<td>48</td>
<td>74</td>
<td>22</td>
<td>39</td>
</tr>
<tr>
<td>300</td>
<td>72</td>
<td>82</td>
<td>31</td>
<td>48</td>
</tr>
<tr>
<td>400</td>
<td>96</td>
<td>92</td>
<td>40</td>
<td>57</td>
</tr>
</tbody>
</table>

* Average reading after four trials.
dle and present no danger to the central venous cir-
culation.

We do recommend, however, that the Abbott/Shaw
Life Care Pump be avoided for the administration of
fluids through a central venous line for the following
reason. The stroke rates, being similar to the clinical
range of human heart rates (at infusion rates of 200–
400 ml/h), and pseudoarterialization of the CVP trac-
ing during needle infusion will interfere with monitor-
and interpretation of the CVP.

Another Way to Insert a Macintosh Blade

To the Editor:—The letter by Lagade and Popper¹
pointed out a useful technique. However, there are two
additional points to consider. First, the Polio Macintosh
blade gives poor mechanical advantage, because little
force can be applied and control is minimal. Second,
difficulty is usually encountered only during insertion.
Once the blade is placed down the pharynx, there is
ample space for the handle in its normal configuration.

The following technique allows the normal Macin-
tosh blade to be used in most of these difficult cases.
With the patient’s head in the sniffing position and the
neck slightly extended, open the mouth as widely as
possible. Next, without the handle attached, insert the
Macintosh blade into the mouth and pharynx gently and
as far as possible. Control the blade by holding it with
the left thumb and placing the left index finger along
the cephalad surface with the blade held firmly against
the tongue. It is usually only a simple matter to connect
the handle to the blade. This technique gives the anes-
thesiologist all the advantages of the normal Macintosh
blade in a patient whose anatomy normally would pre-
vent the insertion of the blade-handle assembly.

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REFERENCE
1. Lagade MRG, Popper PJ: Revival of the Polio laryngoscope
blade. ANESTHESIOLOGY 57:545, 1982

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