

Doctors: Diana's injuries impossible to survive

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LONDON (CNN) -- Princess Diana's injuries from the Paris car crash were so severe and her blood loss so massive it would have been impossible for her to survive, British doctors said Sunday.

As details emerged about the accident that killed the princess and her millionaire Egyptian companion Dodi Fayed in Paris, medical experts in London heaped praise on their French counterparts and said they had done everything possible to save her life.

"I think one would say they were unsurvivable injuries," said Alastair Wilson, the director of emergency services at the Royal London Hospital.

"The French ambulance service, the people doing the extrication (from the mangled wreck) and the hospital certainly appear to me to have done extremely well. On the evidence I've got, they get top marks for doing all and a bit more," he added.

Diana, 36, died of cardiac arrest after doctors at Paris' Hospital La Pitie Salpetriere repaired a tear in a ruptured pulmonary vein and massaged her heart for two hours in an effort to get it pumping again.

Last-ditch attempts not rare

Doctors' last-ditch attempts to save Diana, including the lengthy heart massage, are considered extreme but hardly rare, especially for healthy young victims of auto accidents.

When Diana arrived at the hospital, she was bleeding heavily from the chest.

Dr. Bruno Riou, head of the hospital's intensive care unit, said doctors opened her chest and found "an important wound of the left pulmonary vein," which carries blood from the lungs to the heart.

The wound, the apparent source of the bleeding, was closed.

The doctors tried to revive her with the chest massage -- first externally and then directly to the heart -- but it failed and she was declared dead about four hours after the crash.

'Not just celebrities'

"It's not just celebrities who get that kind of treatment," said Dr. Thomas Martin, an emergency medicine specialist at the University of Washington Medical Center in Seattle. "It's probably not much different than would be done for any other young healthy person."

When the heart stops beating, doctors have about four minutes to restore blood flow before permanent brain damage sets in. Even if the heart fails to begin pumping

again on its own, however, doctors can often prevent brain injury by pushing on the heart to restore circulation.

In cases of cardiac arrest following multiple severe injuries, such as bad car crashes, doctors may open up the chest both to look for sources of bleeding and to give them direct access to the heart.

Standard cardiopulmonary resuscitation -- CPR -- performed externally on the chest, typically pumps about 10 percent of the usual amount of blood. But massaging the naked heart directly can achieve almost normal circulation.

"Opening up the chest is only done as a last-resort measure to try to salvage. . . But if you don't open up the chest, you might as well pronounce them dead," said Dr. David Frankle of Cedars-Sinai Medical Center in Los Angeles.

Victim's age a factor

"Typically, depending on the case, after 30 or 40 minutes, you would stop," said Dr. Kathleen Raftery of Brigham and Women's Hospital in Boston.

One exception is if the heart resumes beating on its own for a few minutes and then stops again. In such cases, doctors might keep massaging the heart for several hours, hoping to revive the victim.

Doctors say they will go to great extremes in such cases, especially if the victims are young.

In older victims, resuscitation attempts are often complicated by clogged arteries, which impair the flow of the manually pumped blood to the brain.

But the young sometimes are able to come through such extreme trauma reasonably well. This can be especially true in situations where damage to a major blood vessel is causing bleeding near the heart.

"Sometimes if you get in quickly and clamp it off, you can dramatically resuscitate these people," said Martin. "That's probably why they went to the unusual step of opening the chest."

Pulmonary vein crucial

Riou, from the Paris hospital, told reporters the surgeons stopped trying to restart her heart after massive internal bleeding in the chest, despite repairs to the ruptured left pulmonary vein.

The pulmonary vein is one of the most important because of its close proximity to the heart. Blood flows away from the heart in arteries and back to it in veins.

The left pulmonary vein, Wilson said, "bleeds a lot if it gets torn and it can let air into the left side of the heart, which means air can be pumped into the body, so it is an extremely dangerous injury indeed." Doctors first tried to revive the princess at the scene of the accident in a road tunnel in the French capital and surgeons later opened up her chest to perform a thorocotomy -- surgery to repair the pulmonary vein to stop the bleeding.

'Right hospital at the right time'

"Clearly they found that there was something they could do which they felt could save her life and they were absolutely right in that. I believe they must have had the right surgeons in the right hospital at the right time," Wilson said.

But he said that due to a number of factors -- other injuries, blood loss, air that got into her system -- they were unable to save her.

"After a cardiac arrest it is really difficult to resuscitate people," he added.

John Pepper, a consultant cardiac surgeon at London's Brompton Hospital, said the French doctors had tried to control the bleeding, but Diana's heart was already functioning badly and was too severely damaged.

"When the pulmonary vein ruptures you can lose a huge amount of blood in a very short time," he said.

The Associated Press and Reuters contributed to this report.