Pre-hospital treatment for seriously injured patients

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Scientists hope to have paved the way for the development of potentially new life-saving treatments to be administered to seriously injured patients in the critical first hour of injury.

By testing the blood samples of 91 patients taken at the scene of major accidents, scientists were able for the first time to establish how quickly the lining of blood vessels are damaged, which can lead to a rapid deterioration and even organ failure.

The research, published today in Shock, is part of the ongoing 'Golden Hour' study led by scientists from the University of Birmingham's Institute of Inflammation and Ageing, the NIHR Surgical Reconstruction and Microbiology Research Centre (SRMRC) and the Royal Centre for Defence Medicine at Queen Elizabeth Hospital, Birmingham.

A major £10 million study, Golden Hour aims at improving outcomes for patients by developing the understanding of what happens to the immune system within the first 60 minutes from the moment of traumatic injury – a crucial time in which prompt medical treatment is key to survival.

Major David Naumann, a research fellow at the Royal Centre for Defence Medicine and the University of Birmingham, said: "When someone is very seriously injured, for example in a car crash, the body sometimes behaves as if there is a massive infection that it needs to fight, even when none is present.

"When this happens, the immune system can cause the patient to deteriorate rapidly and could even cause their organs to fail."

Dr Jon Hazeldine, of the University of Birmingham, continues: "One of the things that may be to blame for this process is endotheliopathy which occurs when the lining of blood vessels is damaged.

"Prior to our study, it was not known when this process happens after injury, or whether having endotheliopathy within an hour of injury might lead to organ failure later on in hospital."

Professor Janet Lord, of the University of Birmingham, says: "We found that the damage to the lining of the blood vessels happens within minutes of injury, even before an ambulance has arrived, which has never been shown before.

"We also found that if the lining of the blood vessels improves in the following few hours that patients have lower rates of organ failure."

Professor Tony Belli, also of the University of Birmingham, adds: "Our research has identified a potential target for treatment, to heal the damaged blood vessels, which could be administered by ambulance and helicopter crews on arrival at the scene of injury and improve outcomes for injured patients.

"As part of our ongoing Golden Hour study we have several ongoing studies examining the causes of endotheliopathy and which treatments may best be used to treat it."

Key to the research was an around-the-clock blood sampling and analysis operation working in collaboration with West Midlands Ambulance Service and Midlands Air Ambulance, which has seen paramedics being specially trained to take blood samples from patients at the scene of

major traumas.

The observational study used the blood samples taken from 91 seriously injured patients at the scene of a major trauma. Of the 91 patients, who had an average age of 38, 78 were male and 13 were female. Nineteen non-injured individuals were also used as a healthy control. Biomarkers were used to detect endiotheliopathy within the blood. Endiotheliopathy was found to occur five to eight minutes after injury.

More information: David N. Naumann et al. Endotheliopathy of Trauma is an On-Scene Phenomenon, and is Associated with Multiple Organ Dysfunction Syndrome, *SHOCK* (2017). DOI: 10.1097/SHK.0000000000000999

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