

= Anna Bågenholm =

Anna Elisabeth Johansson Bågenholm (born 1970) is a Swedish radiologist from Vänersborg , who survived after a skiing accident in 1999 left her trapped under a layer of ice for 80 minutes in freezing water . During this time she became a victim of extreme hypothermia and her body temperature decreased to 13 @. @ 7 ° C (56 @. @ 7 ° F) , one of the lowest survived body temperatures ever recorded in a human with accidental hypothermia . Bågenholm was able to find an air pocket under the ice , but suffered circulatory arrest after 40 minutes in the water .

After rescue , Bågenholm was transported by helicopter to the Tromsø University Hospital , where a team of more than a hundred doctors and nurses worked in shifts for nine hours to save her life . Bågenholm woke up ten days after the accident , paralyzed from the neck down and subsequently spent two months recovering in an intensive care unit . Although she has made an almost full recovery from the incident , late in 2009 she was still suffering from minor symptoms in hands and feet related to nerve injury . Bågenholm 's case has been discussed in the leading British medical journal The Lancet , and in medical textbooks .

= = Background and incident = =

Anna Bågenholm was born in 1970 in Vänersborg , Sweden . At the time of the incident , she was 29 years old and studying to become an orthopedic surgeon . Bågenholm decided to do her residency in Narvik , Norway , and , in May 1998 , she became a surgeon assistant at the Narvik Hospital . Bågenholm 's mentor during this period was Yngve Jones , a doctor at the Narvik Hospital who was about to celebrate his retirement with a party on 20 May 1999 .

On that day , Bågenholm was skiing in the mountains outside of Narvik with two of her colleagues , Marie Falkenberg and Torvind Næsheim . An expert skier , Bågenholm often skied after work . On this day , as she was heading down a steep mountainside ? a route she had taken several times before ? she lost control of her skis . She fell headfirst onto a layer of ice on a frozen stream near a waterfall , landing on her back . A hole opened up in the ice and Bågenholm 's head and torso were pulled in as meltwater filled her clothes . Her body became trapped under the ice , which was 20 centimetres (7 @. @ 9 in) thick . When Falkenberg and Næsheim found Bågenholm , only her feet and skis were above the ice .

= = Rescue attempts = =

Bågenholm 's colleagues made an attempt to free her but failed . At 18 : 27 local time (CET) , seven minutes after she had fallen into the water , they called for help on a mobile phone . Police lieutenant Bård Mikalsen received the call and put together two rescue teams ; one at the top of the mountain and one at the bottom . Mikalsen also contacted the Bodø rescue team , which was equipped with a Sea King helicopter , but they told him that the helicopter had left to transport a sick child . Mikalsen was persistent and convinced the dispatcher to turn the helicopter around .

Falkenberg and Næsheim held onto Bågenholm 's skis as they waited for the rescue teams to arrive . As Bågenholm first struggled in the cold water , she found an air pocket and was able to remain conscious for 40 minutes before becoming a victim of circulatory arrest . Ketil Singstad led the rescue team from the top of the mountain . He skied as fast as he could to Bågenholm 's location , where he and his rescue team tried unsuccessfully to pull her out with a rope . They then tried to dig her out , but their snow shovel could not break through the ice . Rescuers from the bottom of the mountain then arrived , bringing with them a pointed gardening shovel . They were able to cut a hole in the ice , and pulled her through at 19 : 40 . Bågenholm had been in the water for 80 minutes when she was rescued .

= = Resuscitation and recovery = =

When Bågenholm was pulled out of the water , her pupils were dilated , her blood was not

circulating , and she was not breathing . Falkenberg and Næsheim , both doctors , began giving her cardiopulmonary resuscitation (CPR) . The rescue helicopter soon arrived and Bågenholm was brought to the Tromsø University Hospital in an hour . The helicopter emergency team continued to give her CPR during the flight , and she was ventilated with oxygen . She was also treated with a defibrillator , but to no effect .

Bågenholm arrived at the hospital at 21 : 10 . Her body temperature at the time was 13 @. @ 7 ° C (56 @. @ 7 ° F) , the lowest survived body temperature ever recorded in a human with accidental hypothermia , until fellow Swede Stella , 7 years old , survived 13 @. @ 0 ° C (55 @. @ 4 ° F) at Christmas 2010 . Dr. Mads Gilbert , an anesthesiologist and the chief of the hospital 's emergency room , proceeded with the resuscitation attempt . He commented on Bågenholm 's state : " She has completely dilated pupils . She is ashen , flaxen white . She 's wet . She 's ice cold when I touch her skin , and she looks absolutely dead . " Gilbert had treated many cases of hypothermia before because of the cold climate in Norway , and knew how to treat Bågenholm . The electrocardiogram connected to her showed no signs of life , but Gilbert knew patients should be " warmed up before you declare them dead " . He and his team hoped Bågenholm 's brain had received enough oxygen from the CPR she was given after her rescue .

Bågenholm was brought to the operating theatre , where a team of more than a hundred doctors and nurses worked in shifts for nine hours to save her life . At 21 : 40 , she was connected to a cardiopulmonary bypass machine that warmed up her blood outside of her body before it was reinserted into her veins . Bågenholm 's first heart beat was recorded at 22 : 15 , and her body temperature had risen to 36 @. @ 4 ° C (97 @. @ 5 ° F) at 0 : 49 . Bågenholm 's lung function deteriorated at 02 : 20 , and she spent the following 35 days connected to a ventilator .

Bågenholm soon began to show signs of vitality , and woke up paralyzed from the neck down on 30 May . She feared she would spend the rest of her life on her back , and was angry with her colleagues for saving her . Bågenholm soon recovered from the paralysis , however , and later apologized to her friends ; " I was very irritated when I realized they had saved me . I feared a meaningless life , without any dignity . Now I am very happy to be alive and want to apologize . " Bågenholm 's kidneys and digestive system were not working properly , so she had to recover in an intensive care unit for two more months . After spending 28 days in the Tromsø intensive care unit , she was flown to Sweden in an ambulance helicopter for the remainder of her recovery .

Dr Petter Andreas Steen , professor at the National Hospital in Oslo , said it was " an extraordinary medical achievement " that Bågenholm 's life could be saved . He believed the reason she was able to recover was that her metabolism slowed down during the incident and the tissues inside her body required less oxygen at the low temperatures . According to the journal *Proto* (published by the Massachusetts General Hospital) , Bågenholm 's metabolism slowed down to ten percent of its baseline rate and thus she barely needed any oxygen at all .

= = Aftermath = =

Despite the severe damage to Bågenholm 's body , no permanent brain damage was diagnosed . Gilbert commented on this : " Her body had time to cool down completely before the heart stopped . Her brain was so cold when the heart stopped that the brain cells needed very little oxygen , so the brain could survive for quite a prolonged time . " Gilbert also noted that therapeutic hypothermia , a method used to save victims of circulatory arrest by lowering their body temperature , has become more frequent at Norwegian hospitals after Bågenholm 's case gained fame .

Bågenholm returned to work in October 1999 . On 7 October 1999 ? 140 days after the accident ? she returned to the hospital in Tromsø and met the doctors and nurses that helped save her life . Bågenholm commented : " When you are a patient , you 're not thinking you are going to die . You think , I 'm going to make it . But as a medical person , I think it 's amazing that I 'm alive . " As of October 2009 , Bågenholm has made an almost full recovery , although minor symptoms in hands and feet related to nerve injury remain . In late 2009 , she was working as a radiologist at the hospital where her life was saved .

According to BBC News , most patients who suffer from extreme hypothermia die , even if doctors

are able to restart their hearts . The survival rate for adults whose body temperature has decreased to below 28 ° C (82 ° F) is 10 % ? 33 % . Prior to Bågenholm 's accident , the lowest survived body temperature was 14 @. @ 4 ° C (57 @. @ 9 ° F) , which had been recorded in a child . Gilbert said " victims of very deep accidental hypothermia with circulatory arrest should be seen as potentially resuscitable with a prospect of full recovery . The key success factors of such marginal resuscitation efforts are early bystander actions with vigorous CPR and early warning of the emergency system , early dispatch of adequate rescue units (ground and air @-@ ambulances) and good co @-@ ordination between the resources outside and inside the hospital , aggressive rewarming and a spirit not to give up . " General practitioner Jel Coward from Tywyn , Wales , said persons who are victims of extreme hypothermia are often mistakenly thought dead because it can be difficult to detect a pulse on them . He said this case " really does bring it home to us how cautious one has to be before diagnosing death in people who are cold . "

After the incident , Bågenholm became a subject of fiction and medical textbooks , and her case has been discussed in the leading British medical journal The Lancet . On 25 October 2009 her story was featured on CNN 's television program Another Day : Cheating Death . Hosted by Sanjay Gupta , the program features stories from people who have survived severe conditions against all odds . Bågenholm hoped the program would give the people watching it more knowledge of hypothermia . The story is also included in Gupta 's companion book , Cheating Death : The Doctors and Medical Miracles that Are Saving Lives Against All Odds . On 30 October 2009 , Bågenholm and Gilbert appeared together on the popular Swedish SVT talk show Skavlan , hosted by Fredrik Skavlan .