shoulder injuries. A second group of two climbers in the area assisted Denker in getting his partner out of the crevasse and back down the glacier to 2,700 meters where they spent the night.

The assisting climbers left for help at 1900 reaching the Berg Lake Ranger Station at 0130 on September 1. A Parks Canada rescue team was contacted and the two climbers were evacuated using a helicopter and sling rescue system. Upon arrival at the hospital, it was determined that Breivogel had broken ribs and was suffering from a pneumothorax. (Source: Parks Canada Warden Service, Jim Mamalis)

Analysis

A couple of things come to mind. One, we were still crossing the ice-fall late in the day and late in the season. An earlier start or a higher camp may have helped. Second, we were using a doubled 70-meter (9mm) rope and were tied to the very ends, so a "tighter" belay and/or picket protection placed where the route made bends may have helped in reducing the length of the fall. However, the latter may not have helped in preventing the injuries, because they were the result of snow and ice blocks falling on Bob, not from the fall itself or the length of the fall. Also, when Bob righted himself in the crevasse, he was only about 12 to 18 feet below the lip. The rope stretch over the 35 meters of rope between us would be enough to cause the fall to be this distance.

In the dangerous area of the icefall, it would have been better either to be closer together or to belay the leader at bridges on a relatively short lead rope. Also, icefall crevasses—actually gaps in the icefall rubble—are unlike crevasses in snow-covered glaciers. Icefall crevasse bridges are made of smaller ice rubble which can seem sold when probing, but can break unexpectedly. The ice chunks are obviously more dangerous than soft snow when they fall on the victim.

We were probably over confident due to our extensive glacier experience on the volcanoes in the Northwest. These are usually climbed early to mid-season. We were lucky to have another party nearby to aid in the rescue, to have favorable weather and a good emergency camp location, and to experience an efficient rescue by the Canadian authorities. (Source: Paraphrased from a report submitted by Richard Denkler)

FALL ON ICE, INADEQUATE PROTECTION, PROTECTION (TOOLS) PULLED OUT

New Brunswick, The Quarry

Description: On March 1, three experienced climbers set out for a day of ice climbing at a climbing area known as the Quarry in New Brunswick. G.P., the leader for the first climb selected a moderate 25-meter single-pitch climb that he had led before. The ice appeared to be continuous on the climb and good although not fat. The first two-thirds of the single-pitch climb went smoothly with three or four seemingly solid placements leading up to a short vertical section. The last placement was a pound-in screw at

the level of the bottom of the vertical section but slightly off to the right. Placement of protection on the vertical section was considered but ruled out due to the vertical section being short and the ice on the vertical section not being as solid as it had appeared from below. As the lead moved onto the vertical section, it became apparent that there was better ice and an easier stance slightly to the left of center on the vertical section. The top of the vertical was reached with a couple of moves. The vertical section ended in an ice-covered ledge approximately 15 meters above the start of the climb. The move onto the ledge appeared to be straightforward with a bulge on the right side above and back away from the edge. G.P. placed the right tool in this bulge and the left tool in blue horizontal ice that was also back from the edge. The higher risk of fracture of a bulge was considered but ignored in light of the sound and feel of the right hand tool placement, the perceived quality of the left placement, and the low level of difficulty of the move. As G.P. was pulling up to gain the ledge, the bulge on the right shattered and released the tool. G.P. vividly recalls thinking that the left arm was likely susceptible to some discomfort as a result of a drop-down onto that arm. G.P. also vividly recalls apprehension resulting from the sudden realization that the left tool was also coming free of the ice. He fell about three meters before striking a ramp with his left foot, breaking the left leg at the ankle, and then tumbling backwards. The runout from the highest protection was such that the rope provided no tension until after the leader struck the ramp with his foot. After tumbling backward, he slid headfirst on his back down a steep ramp until the tension of the rope stopped the slide. The length of the slide was longer than necessary. The lowest piece of protection was a pound-in screw that pulled out under the directional force and the belay stance was away from and off to one side of the base of the climb resulting in additional slack in the system. The leader was lowered from the climb and assisted onto a makeshift stretcher by his two climbing partners. The carry down a steep 50-meter slope and another 800 meters through deep snow to a road took 2.5 hours. The last half-hour was with assistance from two additional people. An alternate to the approach route was selected for the evacuation because it was more direct and less obstructed by brush.

Analysis

G.P. states he has learned some lessons:

Never trust a bulge.

Do not underestimate the horizontal forces exerted on tool placements while topping out.

As with rock climbing give due consideration to location, type, and placement of the first protection if the belayer is not immediately below that piece and subsequent protection.

Know your first aid and self-rescue techniques.

Consider possible means of evacuation of an injured climber before accidents occur.

The Canadian editor would add that the riskiest moves are pulling over a lip or a bulge where the angle of the ice changes. Wherever possible, the leader should place protection before attempting to move from vertical ground over a bulge or ledge. A leader should always be considering how far down his last piece is and the likelihood of hitting ledges on the way down.

In this respect moderate climbs can be more dangerous than truly vertical terrain if a fall occurs. Lower extremity fractures such as this are a common result. (Source: George Porter and Edwina Podemski)

(Editor's Note: Edwina Podemski did all the analyses where no name appears as a source.)