How Burial Time of Avalanche Victims is Influenced by Rescue Method: An Analysis of Search Reports from the Alps

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Abstract. Two hundred and seventeen avalanche reports from Switzerland and the Tyrol were used to investigate the influence of rescue method on the survival and burial time of avalanche victims. The probability of survival for victims rescued by their companion was higher (75%, \( n = 113 \)) than for people found by an organised search team (30%, \( n = 104 \)). Burial time and burial depth are the main factors, which decide whether a person is recovered dead or alive. People who were still alive were recovered significantly earlier and from a shallower burial depth than people who died in an avalanche. There is also a significant difference in the burial time dependent on whether companions or rescue teams carry out the search. In localising the site by means of sight/call or avalanche beacon by companions there is a clear relation between burial time and burial depth. For rescue teams, the relation between burial time and area of the avalanche is important. When working with avalanche dogs or probe lines there should be a clear correlation between burial time and area of the avalanche. For dog teams arriving at the scene, there is a relation between search/excavation time and burial depth. Search time for tour skiers based on the information given will always be limited due to the burial depth of the victim. This means that the digging tools used are very important. The greatest problems facing rescue teams are limited transport capacity and the organisation of the whole mission over a large area. Therefore, speed and efficiency are of the utmost importance, when organising any search.

Key words: avalanche, burial time, burial depth, avalanche dog, avalanche beacon, probing, equipment

1. Introduction

Every year about 25 people die because of avalanches in the Austrian Alps (Mayr, 2001). To analyse the cause of these incidents a great variety of parameters has been collected. These avalanche statistics may be used to avoid avalanche incidents in the future, make it possible to estimate trends over many years (Tschirky et al., 2000) and to predict the risk of causing an avalanche (comp. Munter, 1999). Furthermore, it also becomes possible to estimate the likelihood of survival for an avalanche victim (comp. Armstrong and Williams, 1992; Falk et al., 1994). An initial analysis of the data with
regard to different rescue methods shows that people rescued by their companion have a higher chance of survival than victims rescued by an organised search (Brugger et al., 1996; Tschirky et al., 2000). In order to successfully locate a buried person, quick localisation and excavation is of the utmost importance (Falk et al., 1994). The method used to locate the victim whether it be by sight, probing, avalanche dog or avalanche beacon can greatly influence the success of the search. Moreover, the relation between the gradient of the slope, avalanche area, burial depth and burial time of the victim must not be underestimated.

This analysis of avalanche incidents investigates, which factors influence the time taken to locate the victim and therefore the probability of his/her survival in an avalanche. It has therefore to be asked: how great is the impact of the different parameters and how are they related to the rescue method? The results of this analysis aim to provide further recommendations for equipment and information which would be essential for tour skiers, and also offer suggestions for optimising the search strategies implemented by rescue teams.

2. Material and Methods

For the analysis, data from the winter reports of the Lawinenwarndienst Tirol from 1995/1996 to 2000/2001 (winter report 5–10; see Amt der Tiroler Landesregierung, 1996–2001) and the Eidgenössisches Institut für Schnee- und Lawinenforschung from 1995/1996 to 1998/1999 (Schnee und Lawinen in den Schweizer Alpen Nr. 60–63) was considered. The following data was available for the accidents documented in the reports: length and breadth of the avalanche, gradient of slope, type of rescue mission (companion or organised search), method of localisation (dog, sight/call, probe, avalanche beacon), burial depth, burial time, recovery dead or alive. The area of the avalanche was calculated as the product of length and breadth. This figure can only be regarded as an estimate but gives a rough impression of the size of the avalanche. Only searches, which started immediately after the accident were considered; those search missions, which were delayed for more than two hours because of impending darkness or bad weather conditions were not considered. Overall, 217 incidents have been included in this part of the analysis. For the data used, the percentage of people rescued dead or alive was calculated, divided by different methods of rescue and localisation. The mean value and standard error were calculated separately for burial time and burial depth, according to the method of rescue and localisation. The differences between these results were tested using the Mann–Whitney U-Test and the Kruskal–Wallis Test. To test the relation between burial time and area of avalanche, burial depth or gradient of slope, the Spearmann rank-correlation test was used.