Effect of hyperbaric oxygen on the healing of surgical wounds

The data shown to the right were obtained in an experiment conducted by Dr. George Huang of the Department of Surgery at the University of Chicago. The experiment was designed to investigate the effect of hyperbaric O\textsubscript{2} treatment on the healing of surgical wounds in diabetic rats. (Diabetics, both human and animal, tend to have more complications following surgery than non-diabetics.) Thirty rats were first given a drug that has the effect of destroying the pancreas, thereby making the rats diabetic. All the rats underwent surgery, during which an incision was made along the entire length of the back. This was immediately sewn up with staples. The treatment group of 15 rats was subjected to a hyperbaric O\textsubscript{2} treatment, i.e., a 100% O\textsubscript{2} environment at 2 atmospheres pressure, for 90 minutes per day following surgery. The control group also received O\textsubscript{2} treatment for 90 minutes daily, but at normal atmospheric pressure. Six rats had glucose levels that were deemed too low to be considered diabetic, and were excluded from the experiment. (You may assume that these high insulin levels were unrelated to the treatment.) After a 24 day recuperation period the 24 rats still participating in the experiment were sacrificed, i.e., killed. Strips of skin were taken from each of five sites on each rat, each site crossing the surgical scar in a right angle. The strips were put on a tensiometer and stretched to breaking point. The observations in the table give the energy required to break the specimen. Unfortunately some specimens slipped out of the clamps for reasons unconnected with the strength of the specimen. For these specimens, no observation could be made: the values are indicated by -- in the table. Rats 1–14 received the hyperbaric treatment: rats 15–24 were the controls.

The main objective is to determine whether or not hyperbaric O\textsubscript{2} treatment has an effect on the healing of surgical wounds and whether the effect depends on the position of the wound on the back. Obtain confidence intervals for the size of any such effects. Summarize your conclusions in a brief (one page) report for Dr. Huang, supplemented by up to 5 pages of technical documentation. Approximate analyses based on realistic assumptions are preferable to exact analyses based on unrealistic assumptions or exact analyses not carried to completion.

The data are in \texttt{.../rats.dat} with missing values coded as zeroes.