

MATHEMATICAL MODEL TO ANALYSE PHYSIOTHERAPEUTIC TREATMENT IN POST RADICAL PROSTATECTOMY URINARY INCONTINENCE

Hypothesis / aims of study

The incidence of urinary incontinence after radical prostatectomy ranges between 2,5% and 87%, being this one of the most bothersome complications that impacts the quality of life of these patients.[1] This fact occurs due to sphincteric deficiency and/or bladder abnormalities. The purpose of this study is to assess two different mathematical models used in the analysis of physiotherapeutic pelvic floor exercises results. We reanalyzed previously published results [2] using different statistical methods. The goal of mathematical models is to provide the best analysis possible in a given circumstance. We do not intend to question or modify previous conclusions but to perform a different approach of the data, thru mathematical non linear models, believing to get better results.

Study design, materials and methods

Two different mathematical models were used: the linear model and an asymptotic exponential model. The linear model was obtained adjusting the data for the first 20 weeks with the squared correlation coefficient R^2 . The non-linear model was found using the following steps: first we plotted the dispersion diagram, and then inverted the graphic order to find an exponential equation. Finally we have found the model that describes the data. Thirty-eight patients that had undergone radical prostatectomy at another institution between November 1998 and June 1999 were randomly assigned to a control and treatment group.[2] The treatment group, of nineteen patients, underwent pelvic floor exercises before and after surgery. These patients were also instructed to continue to exercise at home twice daily after discharge. The control group, of nineteen patients had no formal pelvic floor exercises instruction. During the 6, 12, 16, 20, 28 and 52 weeks all patients were asked to fill in a questionnaire of postoperative urinary continence. Incontinence was measured by the number of the pads used.

Results

The linear model that represents the relationship patient control versus week was expressed by the linear function $pc(s) = 0,60s + 12$, where pc represents the number of patients of the control group and s the weeks with $R^2 = 1,00$ and the model for the relationship patient treatment versus week was $pt(s) = 0,78s + 1,54$, where pt represents the number of patients of the group in treatment with $R^2 = 0,96$ (see Fig. 1). The exponential asymptotic model for the situation of the control group versus expressed by the equation $pc(s) = 20 - 17,24e^{-0,03s}$ and for the treatment group the obtained expression was $pt(s) = 16 - 12,93e^{-0,11s}$ (See Fig. 2 and 3).

Interpretation of results

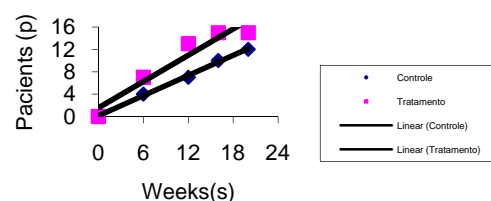
Analysis of asymptotic exponential model shows that during incrementally increasing work, the independent variable is achieved faster for the patients of the treatment group with pelvic floor exercises than to the control group that received no formal information about exercises. The treatment group regained continence earlier compared with the control group at 12 weeks, demonstrating the importance of practicing early pelvic floor exercises after radical prostatectomy, in order to regain urinary continence.

Concluding message

This mathematic model for result analysis allowed the construction of graphics, which makes the interpretation an easier task for the reader. This model can be applied in many other studies.

1. Urology (2000) 56; 627-30.
2. J Urol (2003) 170; 130-3.

Fig. 1. Linear model: control group (black) and treatment group (pink) versus weeks.



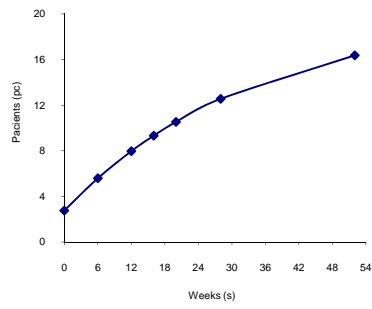


Fig. 2. Non-linear model: asymptotic exponential control group versus week.

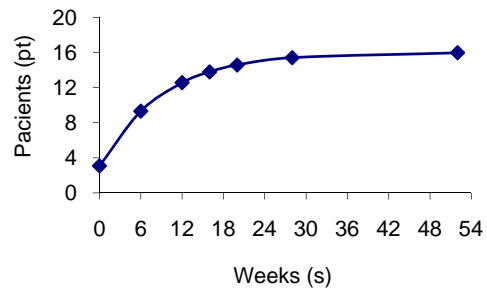


Fig. 3. Exponential asymptotic treatment group versus week.

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