

Diffusion of contrast medium after perineural injection of the palmar nerves: an *in vivo* and *in vitro* study

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Background to design

We have sequences of 5 measurements taken at 0, 10, 15, 20 and 30 min after injection. There are 96 sequences (6 horses by 2 legs by 2 sides by 2 repetitions by 2 radiographs) with for each horse 2 of the 4 possible leg sides measured on each of 4 days in a balanced design.

If we were to fit a multilevel repeated measures model with measurements within sequences we get the following for a linear trend:

$$\text{prox}_{ij} \sim N(\lambda B, \Omega)$$

$$\text{prox}_{ij} = \beta_{0ij} \text{cons} + 0.272(0.019) \text{hours}_{ij}$$

$$\beta_{0ij} = 13.626(1.413) + u_{0ij} + e_{0ij}$$

$$[u_{0ij}] \sim N(0, \Omega_u) : \Omega_u = [180.639(26.558)]$$

$$[e_{0ij}] \sim N(0, \Omega_e) : \Omega_e = [16.787(1.211)]$$

$$-2 * \log \text{likelihood}(\text{IGLS Deviance}) = 3100.426(480 \text{ of } 480 \text{ cases in use})$$

Here a Z test or likelihood ratio test will show that the linear trend is significant so that on average prox takes value 13.626 at time of injection and increases by 0.272 every minute. If we were to question whether the trend is nonlinear we could try further powers of time.

$$\text{prox}_{ij} \sim N(\lambda B, \Omega)$$

$$\text{prox}_{ij} = \beta_{0ij} \text{cons} + 0.5064(0.0565) \text{hours}_{ij} + -0.0078(0.0018) \text{hours}_{ij} \cdot \text{hours}_{ij}$$

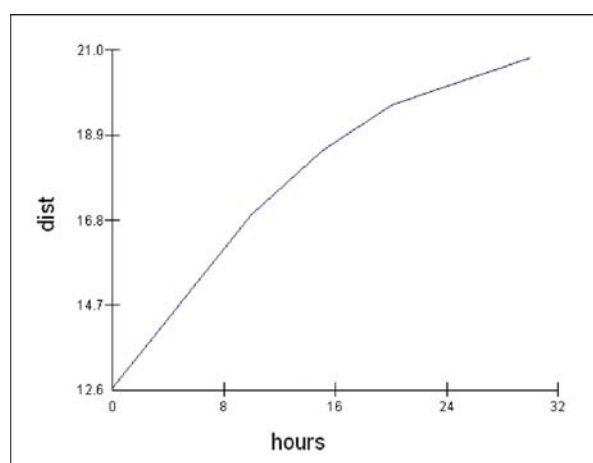
$$\beta_{0ij} = 12.6496(1.4287) + u_{0ij} + e_{0ij}$$

$$[u_{0ij}] \sim N(0, \Omega_u) : \Omega_u = [180.7978(26.5586)]$$

$$[e_{0ij}] \sim N(0, \Omega_e) : \Omega_e = [15.9864(1.1537)]$$

$$-2 * \log \text{likelihood}(\text{IGLS Deviance}) = 3081.6670(480 \text{ of } 480 \text{ cases in use})$$

Here we see that the quadratic term is significant and negative meaning that the increasing trend reduces as time goes on, as shown below:



We find that walking/standing regime has no significant effect.