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Height velocity and height gain in the first year of growth hormone treatment: predictive factors of good statural response in patients born small for gestational age

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Objective

To assess whether growth velocity and change in height are predictive factors for a final adult height standard deviation score >–2 in the French cohort of children born small for gestational age and included in a prospective, observational French registry of children treated with Norditropin® (somatropin; Novo Nordisk A/S).

Introduction

- In 2011, Bang *et al.* showed that growth velocity (GV) and change in (Δ) height in the first year of treatment could be predictive factors of statural response in patients born small for gestational age (SGA) and treated with growth hormone (n=54).[1]
- Poor responders showed GV standard deviation score (SDS) <1 (55%) and Δ height SDS <+0.5 (45%).
- In 2017, Ortego *et al.* confirmed the relevance of the Kabi Pharmacia International Growth Study mathematical model in a retrospective SGA cohort (n=103), showing that the percentage of good responders in the first year varies between 46.6% (Δ height SDS ≥0.5) and 81.6% (GV SDS ≥+1).[2]

Methods

- Between 2005 and 2010, 291 children born SGA, treated with Norditropin®, were included in the observational prospective French registry which followed all patients treated with Norditropin® for this indication.
- All patients participated in follow-up until they reached final adult height (FAH).
- The study is ongoing.
- Of the 90 patients who completed the study, 51 were GH-naïve and were stratified as poor and good responders according to observed FAH SDS ≤–2 or >–2, respectively.
- A logistic regression model was used to predict the FAH SDS (≤–2/>–2), considering GV or Δ height in the first year of treatment.
- The value of the area under the curve (AUC) defines the strength of the model to distinguish poor from good responders, considering the value of explanatory variables (GV or Δ height).
- The strength of the predictive model (AUC) was categorised as low (<0.7), moderate (≥0.7 to <0.9) and excellent (1.0).

Results

- Results are reported for the 51 GH-naïve patients who completed the study.
- Of the 291 patients, 183 were GH-naïve.

Δ height in the first year of treatment

- The best prediction of good response (AUC: 0.63) was obtained by stratifying the variable in these classes: Δ height SDS: ≤0.5/>0.5 (odds ratio [OR]: 3, [confidence interval [CI]: 0.93; 9.70] *p*=0.0665).
- The concordance of observed and predictive FAH for good responders was reported in 67% of patients.
- The error rate of wrong categorisation of patients was 36%.
- The confusion matrix is shown in **Table 1**.

GV in the first year of treatment

- The best prediction of good response (AUC: 0.66) was obtained by stratifying the variable in these classes: GV SDS: ≤0.75/>0.75 (OR: 5.32, [CI: 1.35; 20.98] *p*=0.017).
- The concordance of observed and predictive FAH for good responders was reported in 86.6% of patients.
- The error rate of wrong categorisation of patients was 30%.
- The confusion matrix is shown in **Table 2**.

Table 1 ♦ Change in height in the first year of treatment: confusion matrix

		Predictive values	
		SDS ≤–2	*SDS >–2*
Observed values	*SDS ≤–2*	12	8
	SDS >–2	10	20

One patient with missing data. SDS, standard deviation score.

Table 2 ♦ Growth velocity in the first year: confusion matrix

		Predictive values	
		SDS ≤–2	*SDS >–2*
Observed values	*SDS ≤–2*	9	11
	SDS >–2	4	26

One patient with missing data. SDS, standard deviation score.

Conclusions

- The strength of this predictive model has not been confirmed, perhaps due to the small sample size.
- This type of model could help to manage short stature in patients born SGA needing GH treatment.
- Further investigations are needed to confirm the exact predictive threshold values (Δ height; GV) during the first year of treatment.

References

1. Bang P *et al. A Horm Res Paediatr* 2011;75:335–45.
2. Ortego AB *et al. A Horm Res Paediatr* 2017;88(Suppl. 1):P2-806.

Conflict of interest disclosures

RC, BL, MN and JPS are members of the Scientific Committee of, and investigators for, the SGA Registry; EH and BV are the employees of Novo Nordisk.

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