Computer vision technology in the diagnosis of Cushing's syndrome – advanced studies with a cohort matched by Body-Mass-Index.

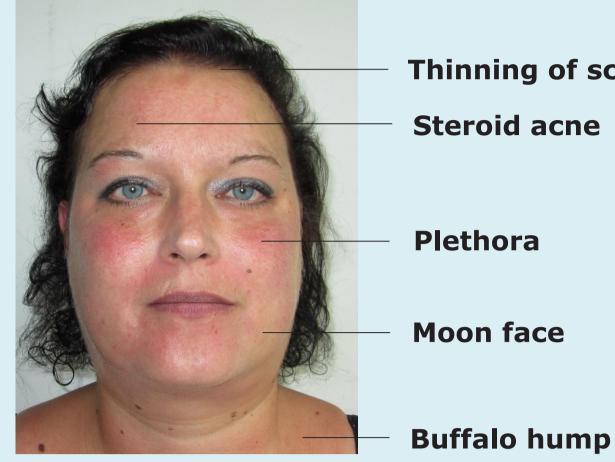**LMU KLINIKUM** DER UNIVERSITÄT MÜNCHEN
MEDIZINISCHE KLINIK UND POLIKLINIK IV
AG NEUROENDOKRINOLOGIE

Max Planck Institute of Psychiatry
German Research Institute of Psychiatry

Kathrin H. Popp[1,2], Robert P. Kosilek[1], Günter K. Stalla[2], Mareike R. Stieg[2], Christina M. Berr[1], Martin Reincke[1], Matthias Witt[1], Rolf P. Würtz[3], Harald J. Schneider[1]

[1]Medizinische Klinik und Poliklinik IV, Ludwig-Maximilians-Universität, Munich, Germany;
[2]Max-Planck Institut für Psychiatrie, Munich, Germany; [3]Ruhr-Universität, Bochum, Germany

MAX-PLANCK-GESELLSCHAFT

Background

Figure 1: Facial symptoms of CS

- Thinning of scalp hair
- Steroid acne
- Plethora
- Moon face
- Buffalo hump

- Cushing's syndrome (CS) often remains undiagnosed for extended periods of time causing serious harm to the body. Distinguishing CS patients from patients that show similar features without true hypercortisolism remains a challenge in clinical practice.

- CS causes typical changes of the face that show a morphological similarity to the metabolic syndrome. Pilot studies regarding the use facial image analysis software as a novel diagnostic tool in acromegaly and CS have shown promising results.

- In this follow-up study we evaluated the use of a facial image analysis tool in the diagnosis of CS with a larger cohort and included control subjects matched by BMI.

Methods

- Inclusion of n=82 (22 m., 60 f.) patients with confirmed CS (45 Cushing's disease, 21 adrenal CS, 12 iatrogenic CS, 4 ectopic CS)

- Inclusion of n=98 (32 m., 66 f.) control subjects matched by age, gender and BMI, with typical clinical signs (e.g. hypertension, diabetes, obesity) but biochemically excluded CS.

- Standardized frontal and profile facial photographs were acquired using a regular digital camera.

- Placement of 36 nodes on disease-relevant facial structures and analysis with the software tool FIDA (facial image diagnostic aid), using a combination of Gabor wavelet transformation and geometry analysis and a maximum likelihood classifier.

- Classification accuracies were calculated using a leave-one-one cross-validation procedure.

Figure 2: Set of nodes, front and side view

Results

	Women			Men		
	Patients (n=60)	Controls (n=66)	p	Patients (n=22)	Controls (n=32)	p
BMI (kg/m²)	30,3 (sd ± 6,3)	32,5 (sd ±7,4)	0,071	28,7 (sd ± 3,7)	30,9 (sd ± 5,0)	0,095
Age	50,6 (sd ± 12,9)	46,1 (sd ± 15,4)	0,080	53,35 (sd ± 12,9)	47,2 (sd ± 15,0)	0,127

Table 1: BMI and age of study cohort, mean and SD, compared with t-test.

	Patients	Controls	Combined
Women n=126	56,7%	64,2%	61,1%
Men n=54	45,5%	81,3%	66,7%

Table 2: Overall classification results.

	Men	Women	Combined
Cushing's disease n=45	50%	49%	48%
Adrenal CS n=21	38%	54%	49%
Iatrogenic CS n=12	67%	89%	83%

Table 3: Classification results by etiology of Cushing's syndrome. N=4 ectopic CS not separately evaluated.

Conclusions

- Regarding the advanced problem of detecting CS patients within a BMI-matched cohort, we have found a satisfying overall classification accuracy by facial image analysis.

- Classification accuracy was better for women and in the subgroup of iatrogenic CS cases, and worse for male patients with adrenal CS. This is most likely due to a varying severity of CS symptoms by etiology.

- Classification accuracy is most likely significantly higher in a study cohort with healthy control subjects.

- Further studies might pursue a different combination of nodes and equations used in the analyses for improving the method.

ECE 2016
871-EP
Pituitary - Clinical
Kathrin H.
Poster presented at: ECE2016 28 – 31 May 2016 MUNICH, GERMANY
PosterSessionOnline.com