

Creating a clinical evaluation system for simple and comprehensive scoring of disorders of sex development

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Introduction and Objectives

The Prader and Quigley classifications (P/Q-C), used widely to evaluate external/internal genitalia in differences/disorders of sex development (DSD) patients, are sometimes unsuitable for determining the stage/grade. The external masculinization score (EMS) is also used to assess masculinization of the external genitalia in mainly 46,XY DSD.

So, we created a simpler, more comprehensive DSD scoring system (DSD-SS).

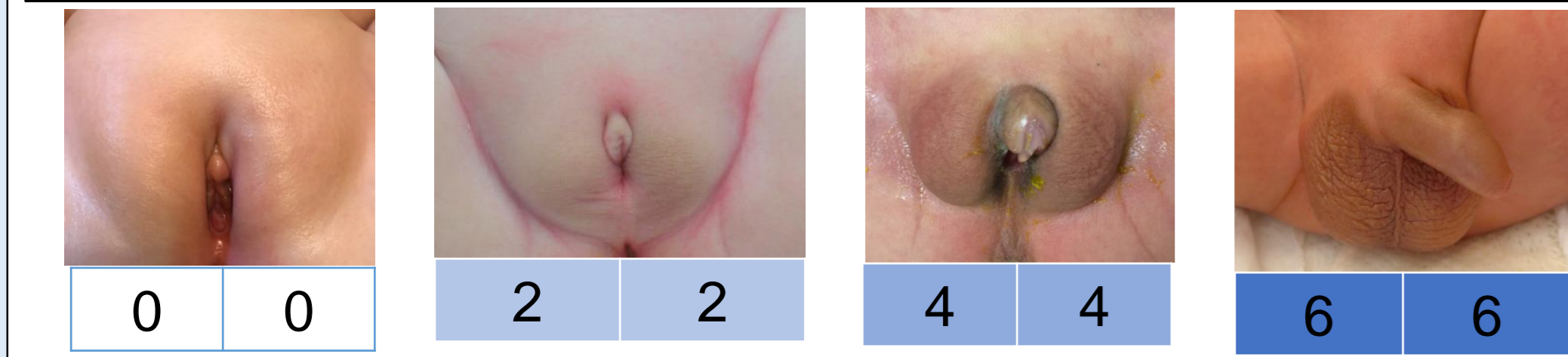
Methods

DSD-SS

I Scrotum or Labia majora

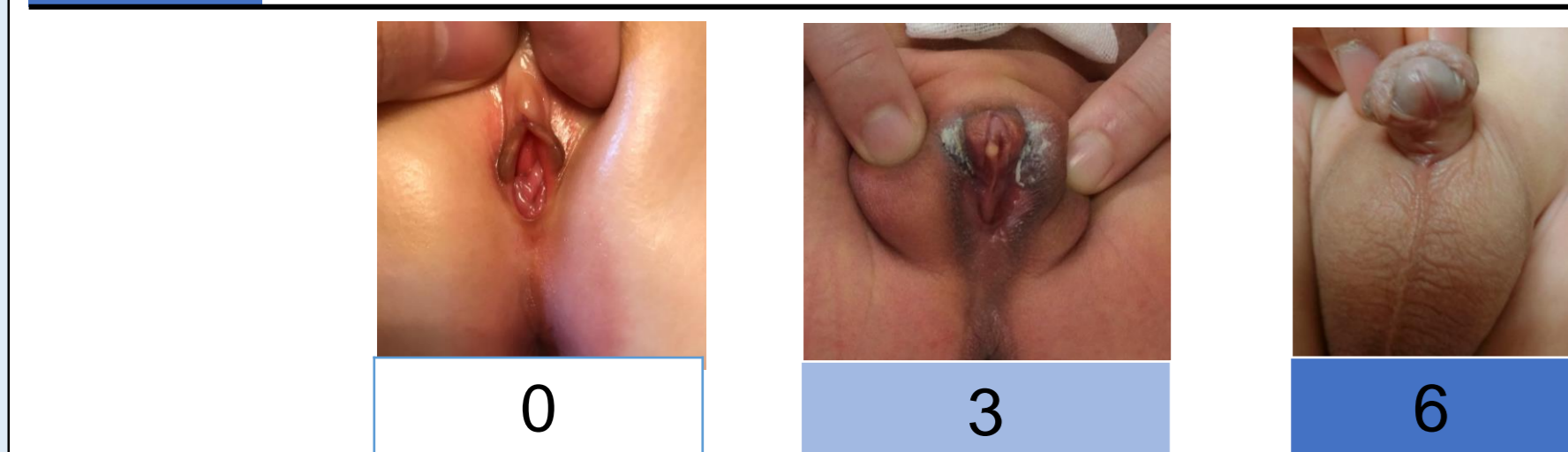
I -① Degree of virilization in right and left

0	Normal female
2	Nearly normal female with minimal virilization
4	Nearly normal male, but smaller than normal scrotum
6	Normal male



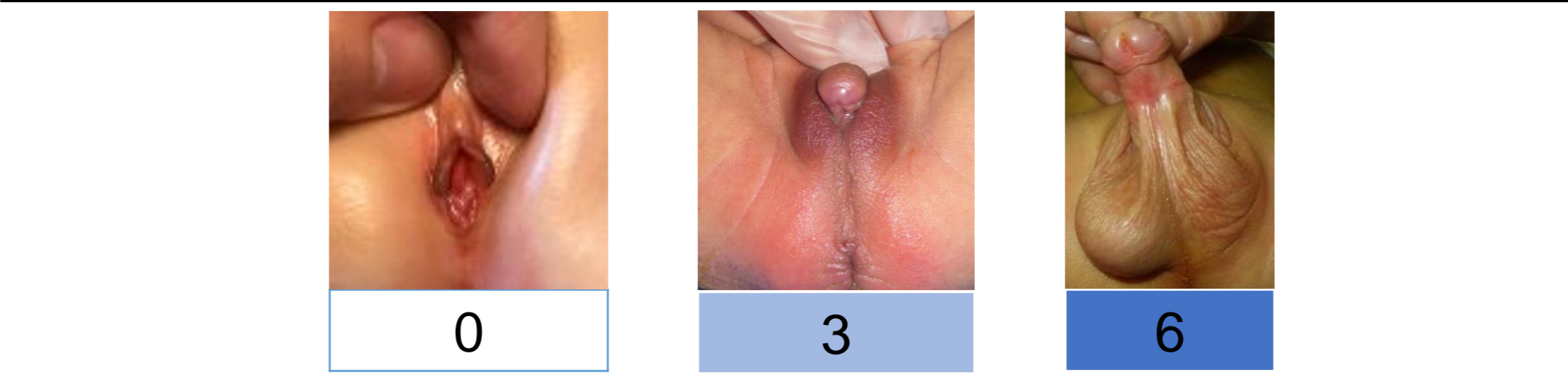
I -② Degree of fusion

0	No fusion
3	Partial fusion
6	Complete fusion



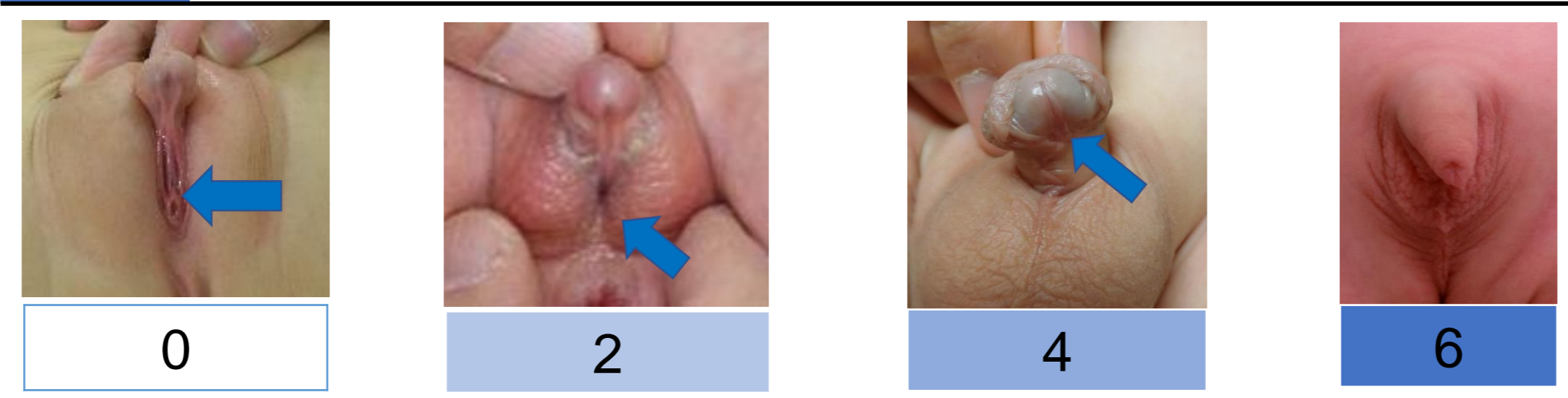
II Glans of phallus

0	Normal female
3	Between 0 and 6
6	Normal male



III Position of urethral orifice

0	Normal female (presence of vaginal orifice)
2	Proximal hypospadias (base of penis or more proximal)
4	Distal hypospadias (more distal than base of penis)
6	Normal male (no hypospadias)



IV Urogenital sinus

0	Absent
6	Present

V Uterus

0	Present (able to confirm portio or endometrium)
6	Absent

VI Positions of gonads in right and left

0	Abdominal or absent
3	Inguinal
6	Scrotal

※ If you are not able to determine one score, you select both scores.

※ Photographs here are external genitalia of newborns and early infants.

Validity evaluation of DSD-SS

1) Difference among examiners

Examiners	27 doctors
Cases	Pictures of 8 cases external genitalia (3 normal, 5 DSD)
Methods	Examiners evaluate I, II, and III, individually.

2) Difference between scores based on direct physical examination and photographs

Examiners	2 paediatric endocrinologists
Cases	DSD 5 cases
Methods	One examiner evaluates I, II, and III of patients based on direct physical examination and the other examines them based on photographs.

3) Compare with Q-C, P-C, and EMS

Examiners	Authors of DSD-SS
Cases	① 45,X/46,XY 15 cases, ② 21OHD 12 cases, ③ genetically proven androgen receptor defects (ARD) 9 cases
Methods	Examiners evaluate Q-C, P-C, and EMS of each cases to compare with DSD-SS in each photographs.

Results

1) Difference among examiners

Case	I-① R	I-① L	I-②	II	III
1 Buried penis	○	○	○	×	○
2 21OHD female	×	×	○	×	○
3 45,X/46,XY DSD	×	×	○	○	○
4 21OHD male	○	○	○	○	○
5 21OHD female	×	×	×	×	○
6 ARD	×	×	○	×	×
7 21OHD female	×	×	○	×	×
8 Labial Adhesion	○	○	○	○	○
Ratio	3/8	3/8	7/8	3/8	6/8

○ : all the same score, × : not

Ratio: ratio of cases all examiners gave the same score
Calculated from results excluding maximum and minimum score

2) Difference between scores based on direct physical examination and photographs

Case	I-① R	I-① L	I-②	II	III
1 ARD	○	○	○	○	○
2 ARD	○	○	○	○	○
3 21OHD	○	○	○	○	○
4 21OHD	○	○	○	○	○
5 Clitoromegaly (Undiagnosed)	×	×	○	○	○

○ : the same score, × : not

3) Compare with Q-C, P-C, and EMS

i) Quigley classification and DSD-SS

① 45,X/46,XY DSD Cases of Quigley grade III

Case	I-①		I-②	II	III	IV	VI	
	R	L					R	L
H	2 or 4	6	3	6	2	6	3	6
A	4	6	3	6	2	6	3	6
B	6	2 or 4	3	3 or 6	2	6	6	3
E	4	6	6	6	2	6	0	6
G	6	6	3	6	2	6	6	0

② ARD

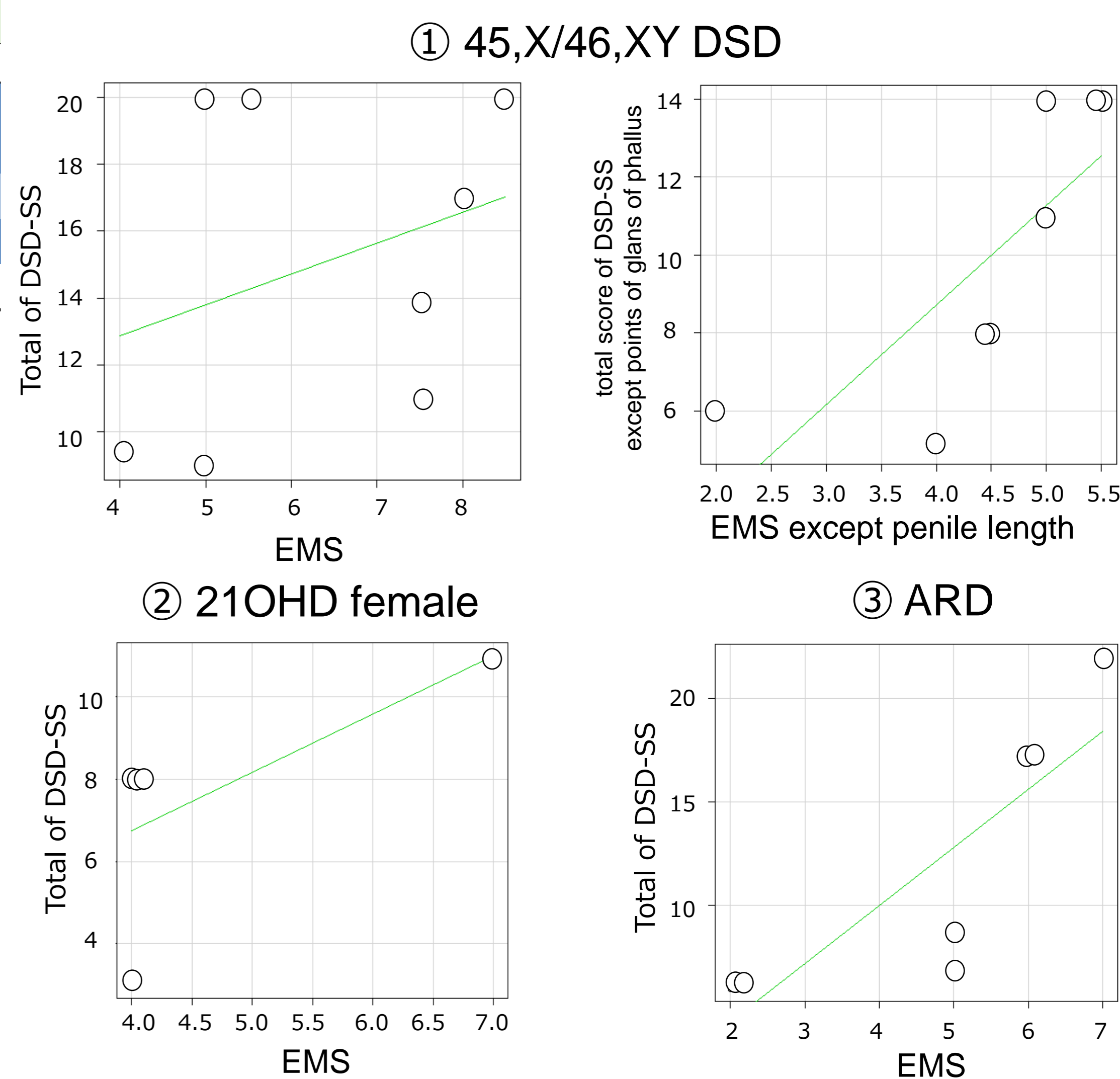
Case	Quigley	I-①		I-②	II	III	IV	VI	
		R	L					R	L
i	II	6	6	6	6	4	0	6	6
j	III	4	4	3	3	2	-	0 or 3	6
k	III	6	6	3	3	2	-	6	6
l	III or IV	2 or 4	2 or 4	3	3	4	3	0	0
m	IV	2	2	3	0	2	6	6	6
n	IV	2	2	3	3	2	-	0 or 3	0 or 3
o	V	2	2	3	3	0	-	3	3
p	VII	0 or 2	0 or 2	0	0	0	0	3	3
q	VII	2	2	0	0	0	0	3	3

ii) Prader classification and DSD-SS

The result was similar to the Quigley classification.
Data was omitted.

iii) EMS and DSD-SS

※ total score of DSD-SS: total of the same items as EMS



Conclusions and Future direction

Although DSD-SS can be used in the same way as the classical classifications. In order to add more objective data, data such as length and width of phallus should be collected.

References

1) Prader A et al. Helv Paediatr Acta. 1954; 9: 231-48. 2) Quigley CA et al. Endocr Rev 1995; 16: 271-321. 3) Ahmed SF et al. BJU Int. 2000; 85: 120-124. 4) Ono H et al. Sci Rep. 2018; 8: 2287.