



OXFORD

Skeletal Development of the Hand and Wrist

A Radiographic Atlas and Digital Bone Age Companion

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Bone Age Companion

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Table 1:
Brush data—Boys: The variability of skeletal age of boys in the Brush Foundation Study

Chronological Age	Number of Hand Radiographs	Mean Skeletal Age (Months)	Optional Adjustment to Chronological Age (months)	Standard Deviation for Skeletal Age (Months)
3 months	121	3.01	0.01	0.69
6 months	129	6.09	0.09	1.13
9 months	137	9.56	0.56	1.43
12 months	130	12.74	0.74	1.97
18 months	106	19.36	1.36	3.52
2 years	105	25.97	1.97	3.92
2.5 years	107	32.40	2.40	4.52
3 years	127	38.21	2.21	5.08
3.5 years	138	43.89	1.89	5.40
4 years	170	49.04	1.04	6.66
4.5 years	176	56.00	2.00	8.36
5 years	191	62.43	2.43	8.79
6 years	186	75.46	3.46	9.17
7 years	182	88.20	4.20	8.91
8 years	168	101.38	5.38	9.10
9 years	160	113.90	5.90	9.00
10 years	177	125.68	5.68	9.79
11 years	154	137.32	5.32	10.09
12 years	165	148.82	4.82	10.38
13 years	175	158.39	2.39	10.44
14 years	163	170.02	2.02	10.72
15 years	124	182.72	2.72	11.32
16 years	99	195.32	3.32	12.86
17 years	68	206.21	2.21	13.05

Modified from: Greulich WW, Pyle SI. *Radiographic Atlas of Skeletal Development of the Hand and Wrist*, 2nd ed. Stanford, CA: Stanford University Press and London, UK: Oxford University Press, 1959.

Table 2:
Brush data—Girls: The variability of skeletal age of girls in the Brush Foundation Study

Chronological Age	Number of Hand Radiographs	Mean Skeletal Age (months)	Optional Adjustment to Chronological Age (months)	Standard Deviation for Skeletal Age (months)
3 months	108	3.02	0.02	0.72
6 months	121	6.04	0.04	1.16
9 months	122	9.05	0.05	1.36
12 months	117	12.04	0.04	1.77
18 months	93	18.22	0.22	3.49
2 years	101	24.16	0.16	4.64
2.5 years	98	30.96	0.96	5.37
3 years	133	36.63	0.63	5.97
3.5 years	131	43.50	1.5	7.48
4 years	154	50.14	2.14	8.98
4.5 years	152	60.06	6.06	10.73
5 years	167	66.21	6.21	11.65
6 years	191	78.50	6.5	10.23
7 years	200	89.30	5.3	9.64
8 years	201	100.66	4.66	10.23
9 years	195	113.86	5.86	10.74
10 years	206	125.66	5.66	11.73
11 years	203	137.87	5.87	11.94
12 years	198	149.62	5.62	10.24
13 years	179	162.28	6.28	10.67
14 years	170	174.25	6.25	11.30
15 years	117	183.62	3.62	9.23
16 years	64	189.44	-2.56	7.31

Modified from: Greulich WW, Pyle SI. *Radiographic Atlas of Skeletal Development of the Hand and Wrist, 2nd ed.* Stanford, CA: Stanford University Press and London, UK: Oxford University Press, 1959.

Table 3:
Stuart data—Boys (Less commonly used than the Brush Foundation Study data); means and standard deviations for skeletal age of the hand and wrist

Chronological Age	Number of Hand Radiographs	Mean Skeletal Age (months)	Optional Adjustment to Chronological Age (months)	Standard Deviation for Skeletal Age (months)
12 months	66	12.7	0.7	2.1
18 months	67	17.5	-0.5	2.7
2 years	67	22.6	-1.4	4.0
2.5 years	67	28.1	-1.9	5.4
3 years	67	33.8	-2.2	6.0
3.5 years	67	39.5	-2.5	6.6
4 years	65	44.8	-3.2	7.0
4.5 years	64	50.3	-3.7	7.8
5 years	64	56.2	-3.8	8.4
5.5 years	64	62.4	-3.6	9.1
6 years	66	68.4	-3.6	9.3
7 years	66	80.6	-3.4	10.1
8 years	63	92.5	-3.5	10.8
9 years	63	104.9	-3.1	11.0
10 years	63	118.0	-2	11.4
11 years	65	132.1	0.1	10.5
12 years	64	144.5	0.5	10.4
13 years	66	156.4	0.4	11.1
14 years	65	168.5	0.5	12.0
15 years	65	180.7	0.7	14.2
16 years	65	193.0	1	15.1
17 years	60	206.0	2	15.4

Modified from: Greulich WW, Pyle SI. *Radiographic Atlas of Skeletal Development of the Hand and Wrist, 2nd ed.* Stanford, CA: Stanford University Press and London, UK: Oxford University Press, 1959.

Table 4:
Stuart data—Girls (Less commonly used than the Brush Foundation Study data); means and standard deviations for skeletal age of the hand and wrist

Chronological Age	Number of Hand Radiographs	Mean Skeletal Age (months)	Optional Adjustment to Chronological Age (months)	Standard Deviation for Skeletal Age (months)
12 months	65	12.7	0.7	2.7
18 months	66	18.4	0.4	3.4
2 years	66	23.7	-0.3	4.0
2.5 years	65	29.0	-1	4.8
3 years	66	34.5	-1.5	5.6
3.5 years	66	40.6	-1.4	6.5
4 years	67	46.4	-1.6	7.2
4.5 years	67	52.3	-1.7	8.0
5 years	67	58.1	-1.9	8.6
5.5 years	67	63.9	-2.1	8.9
6 years	67	70.4	-1.6	9.0
7 years	67	82.0	-2	8.3
8 years	67	94.0	-2	8.8
9 years	67	105.9	-2.1	9.3
10 years	66	119.0	-1	10.8
11 years	66	132.9	0.9	12.3
12 years	66	147.2	3.2	14.0
13 years	66	160.3	4.3	14.6
14 years	63	172.4	4.4	12.6
15 years	61	184.3	4.3	11.2

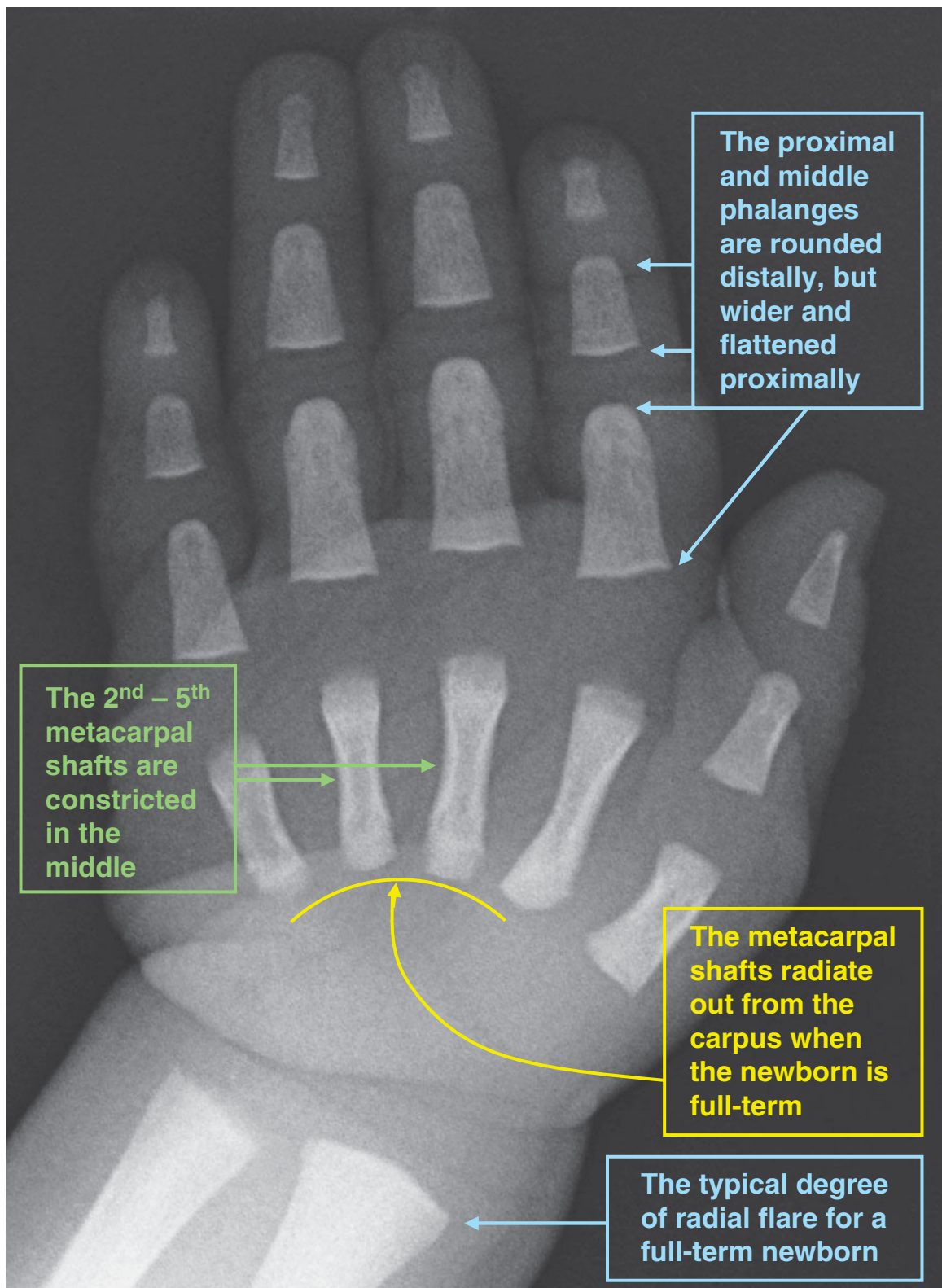
Modified from: Greulich WW, Pyle SI. *Radiographic Atlas of Skeletal Development of the Hand and Wrist*, 2nd ed. Stanford, CA: Stanford University Press and London, UK: Oxford University Press, 1959.

Male Standards

3

Male

Skeletal Age: Newborn (term)



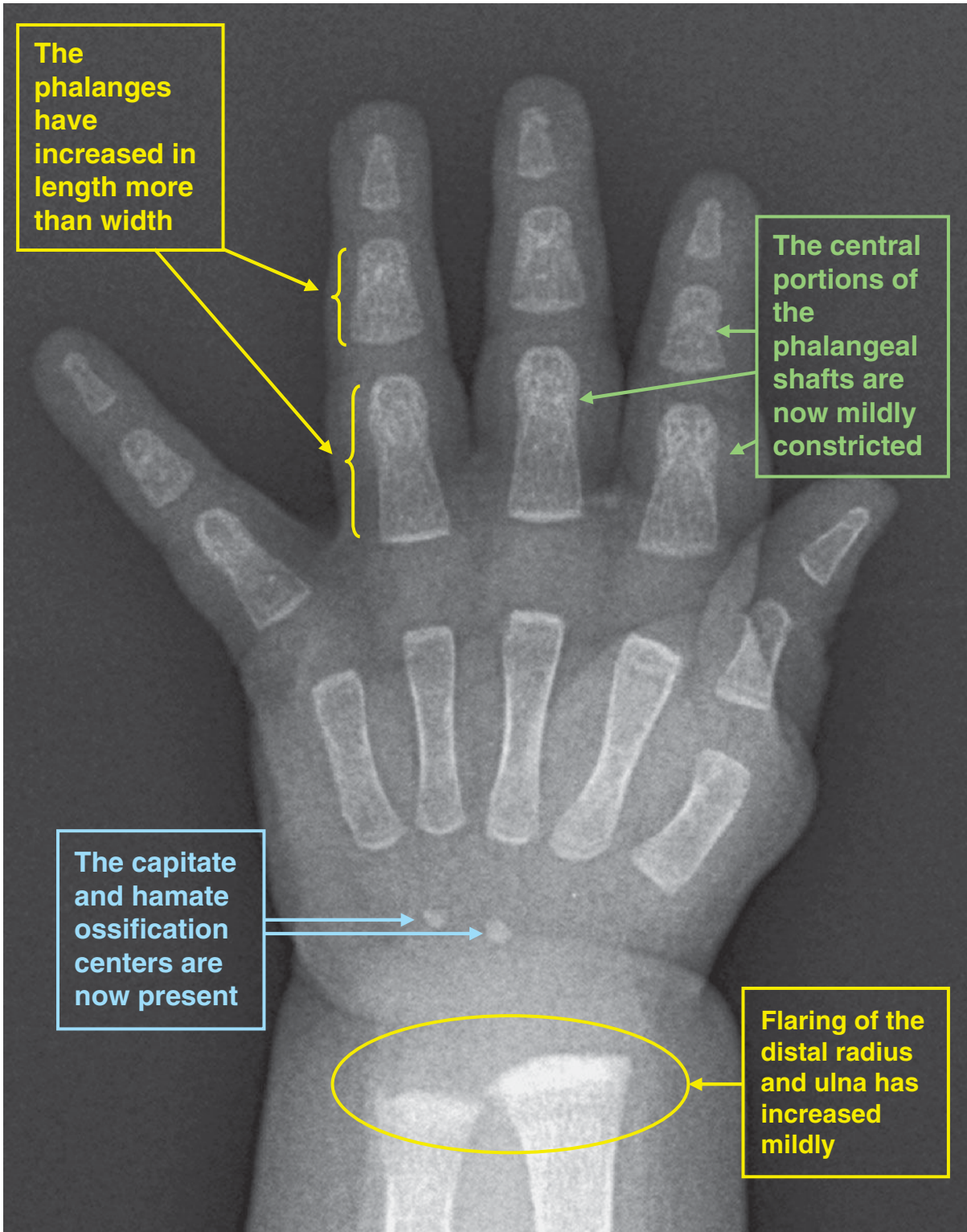
Male

Skeletal Age: Newborn (term)



Male

Skeletal Age: 3 Months



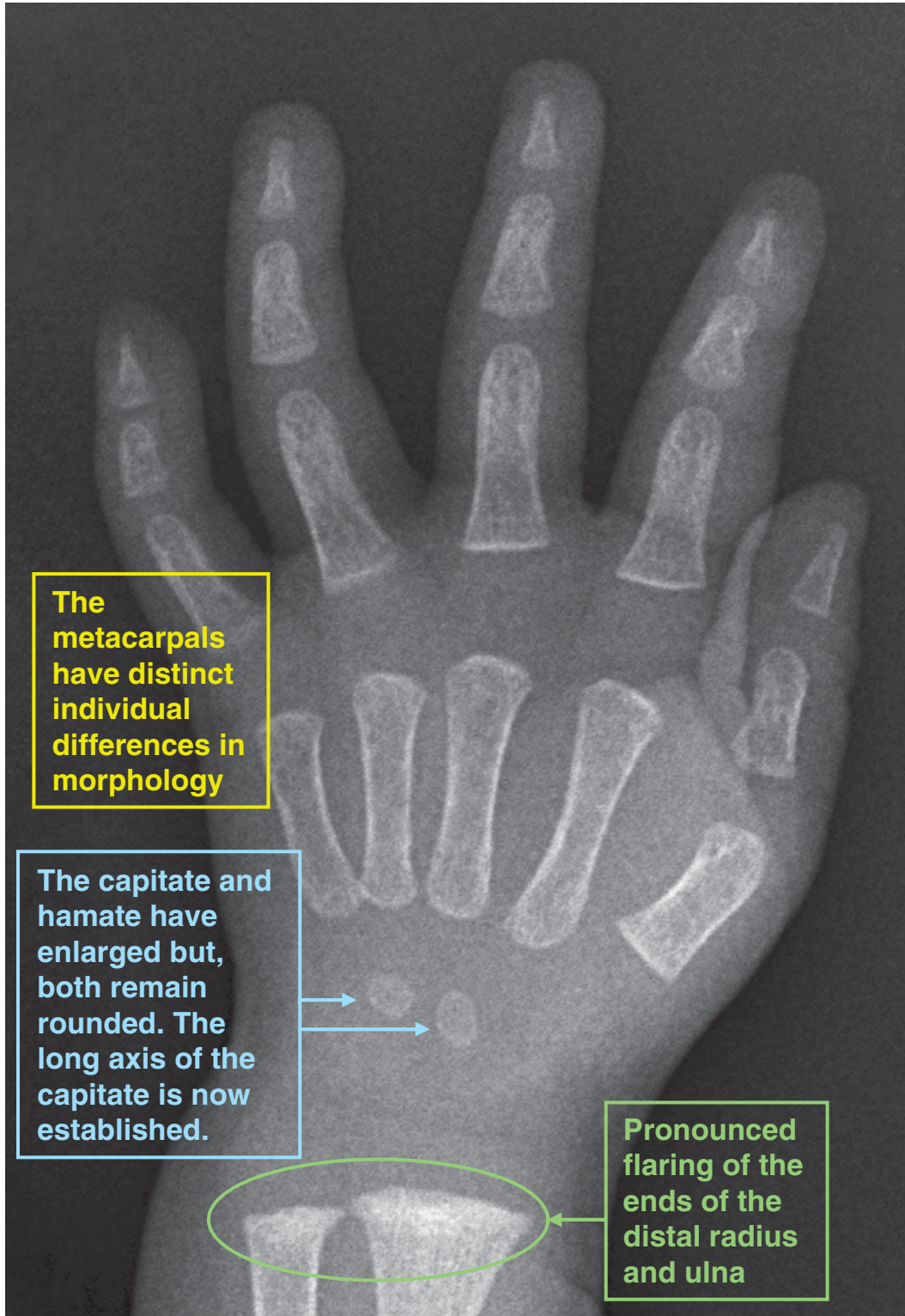
Male

Skeletal Age: 3 Months



Male

Skeletal Age: 6 Months



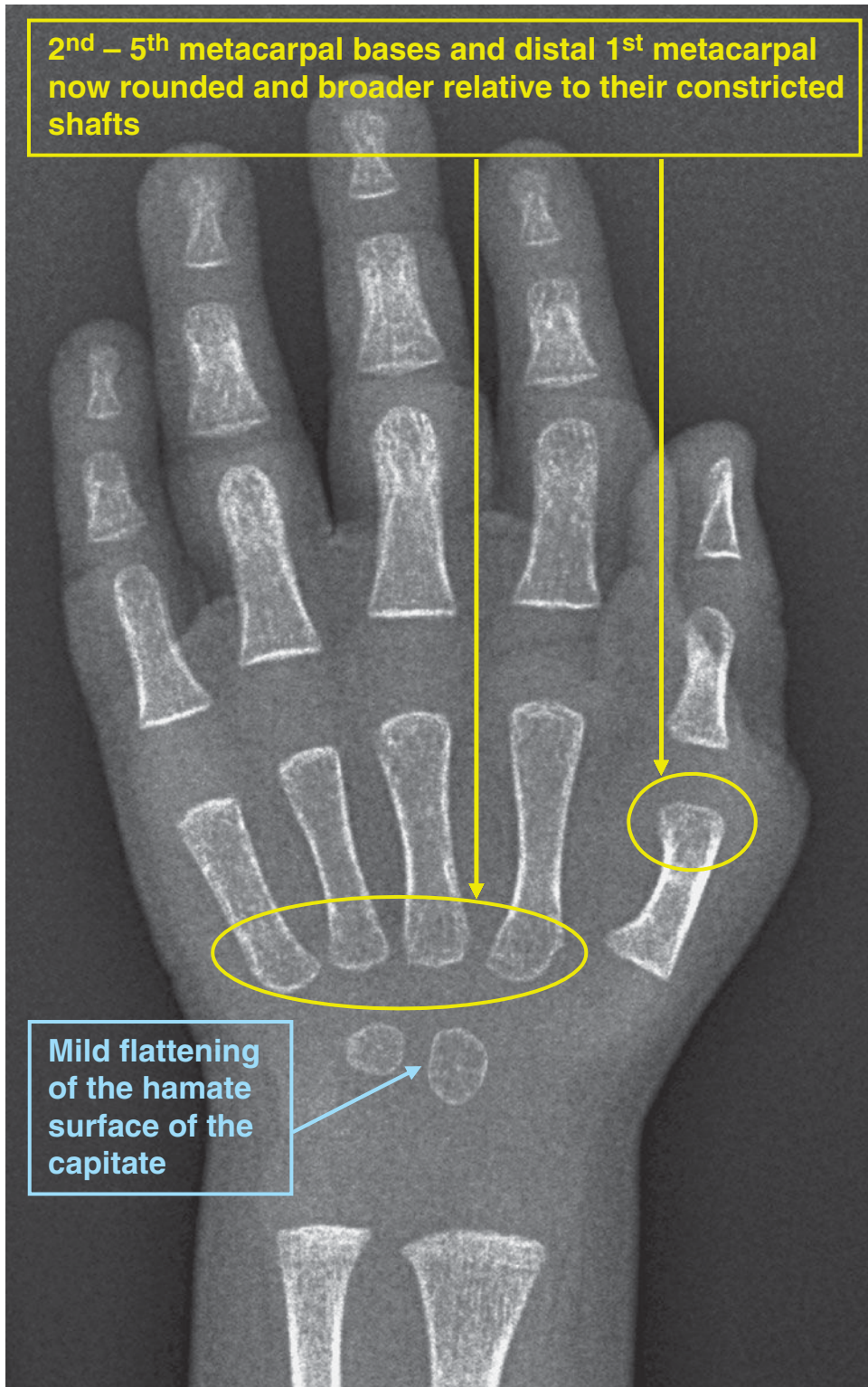
Male

Skeletal Age: 6 Months



Male

Skeletal Age: 9 Months



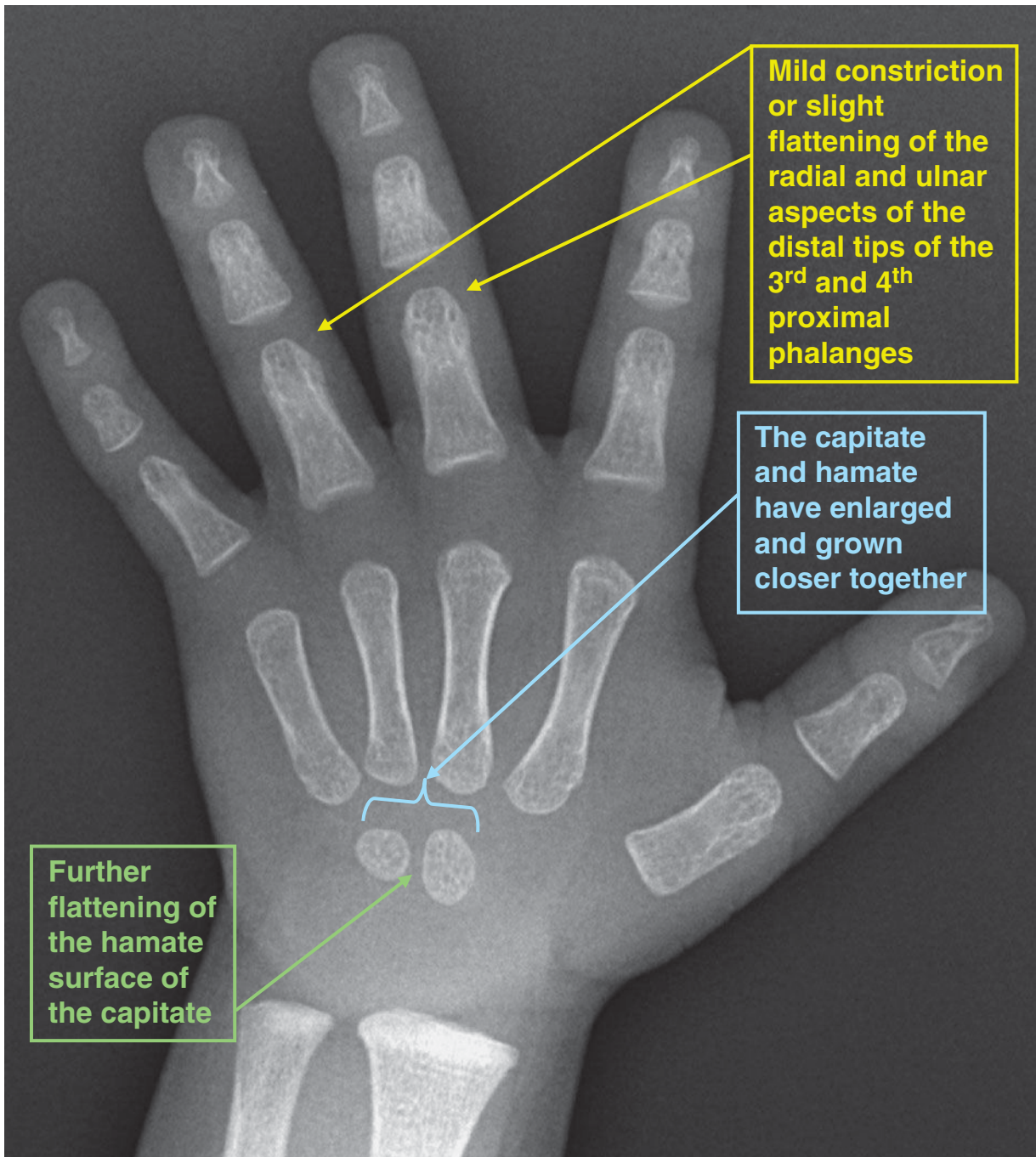
Male

Skeletal Age: 9 Months



Male

Skeletal Age: 1 Year



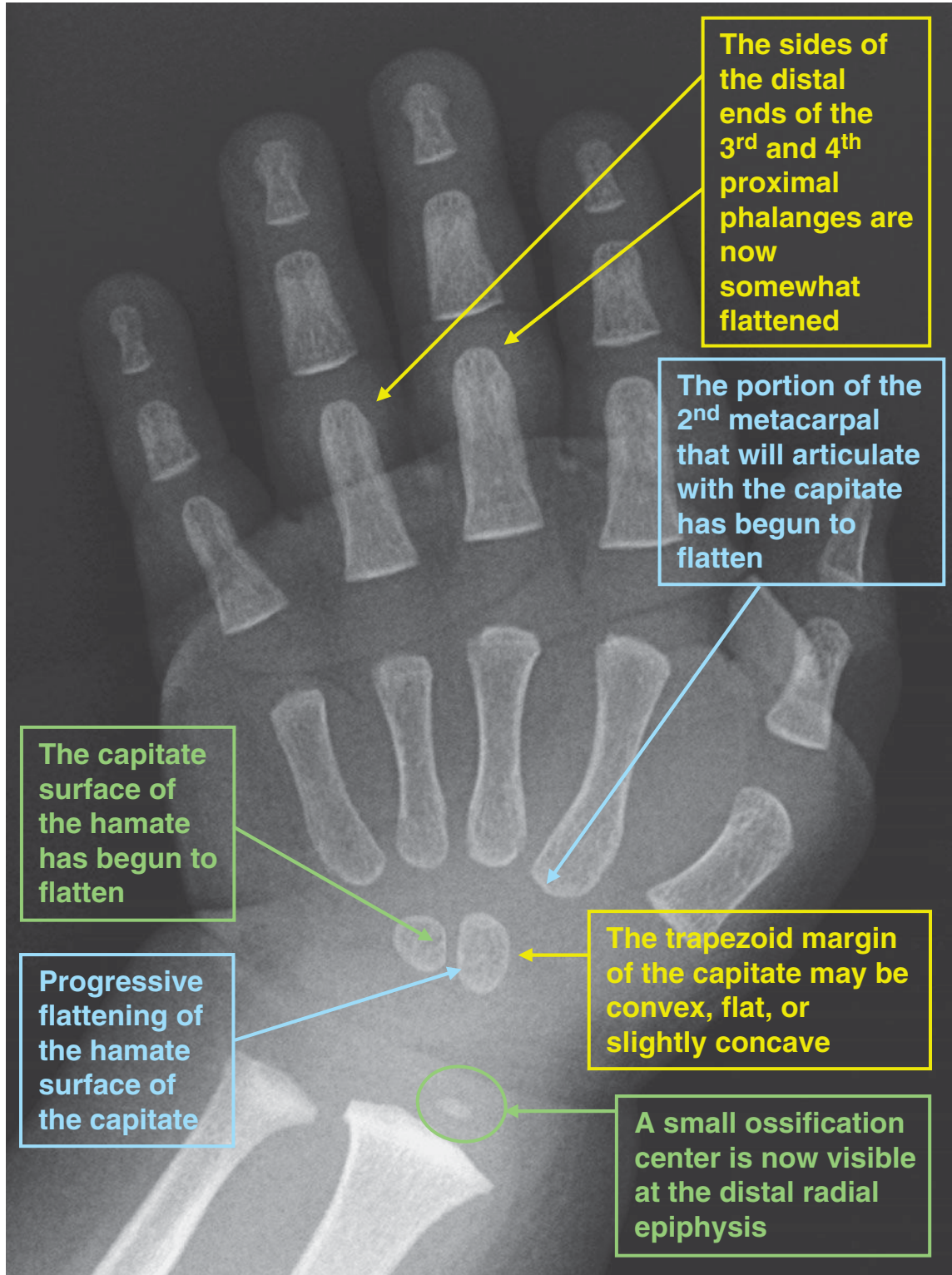
Male

Skeletal Age: 1 Year



Male

Skeletal Age: 1 Year and 3 Months



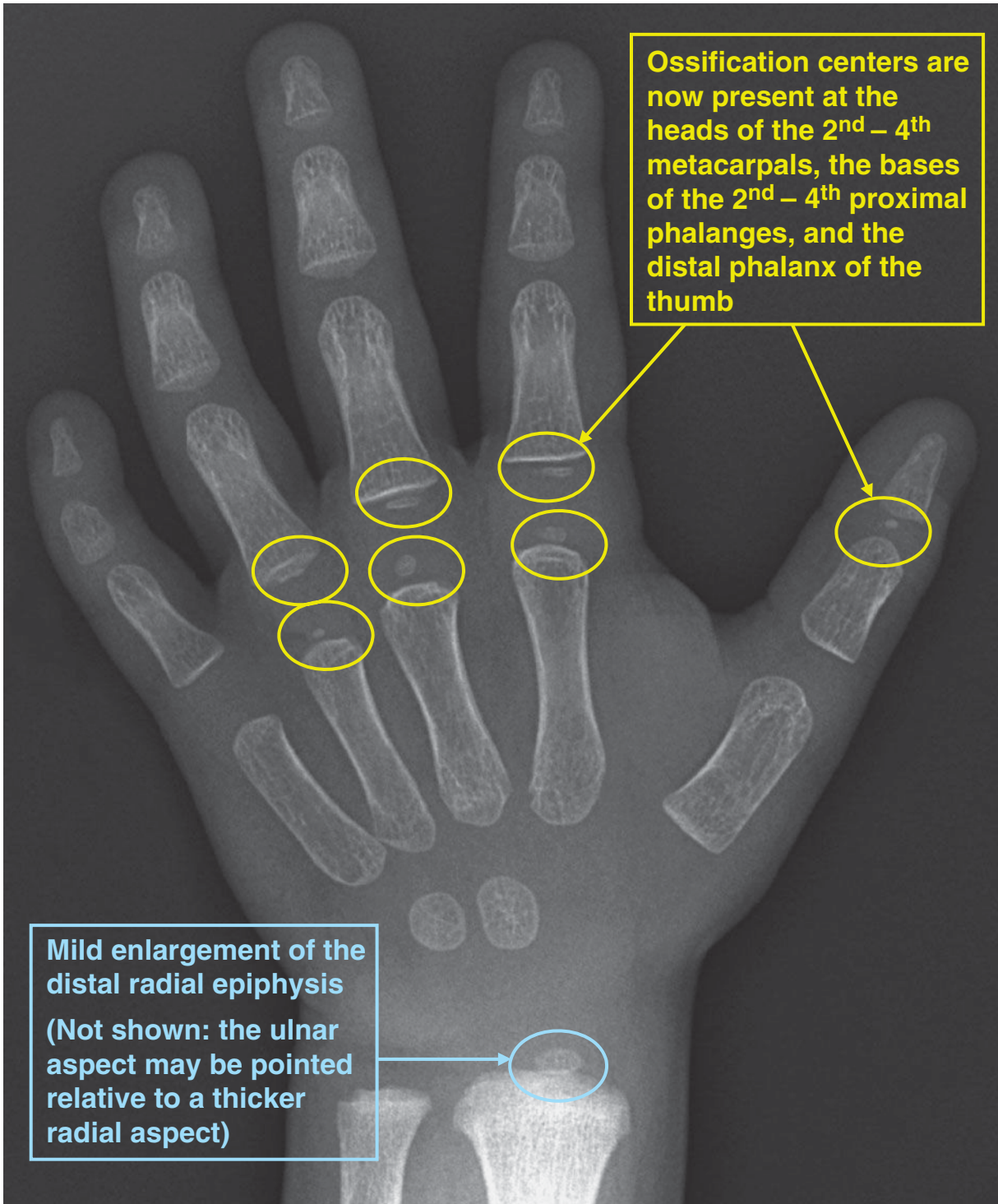
Male

Skeletal Age: 1 Year and 3 Months



Male

Skeletal Age: 1 Year and 6 Months



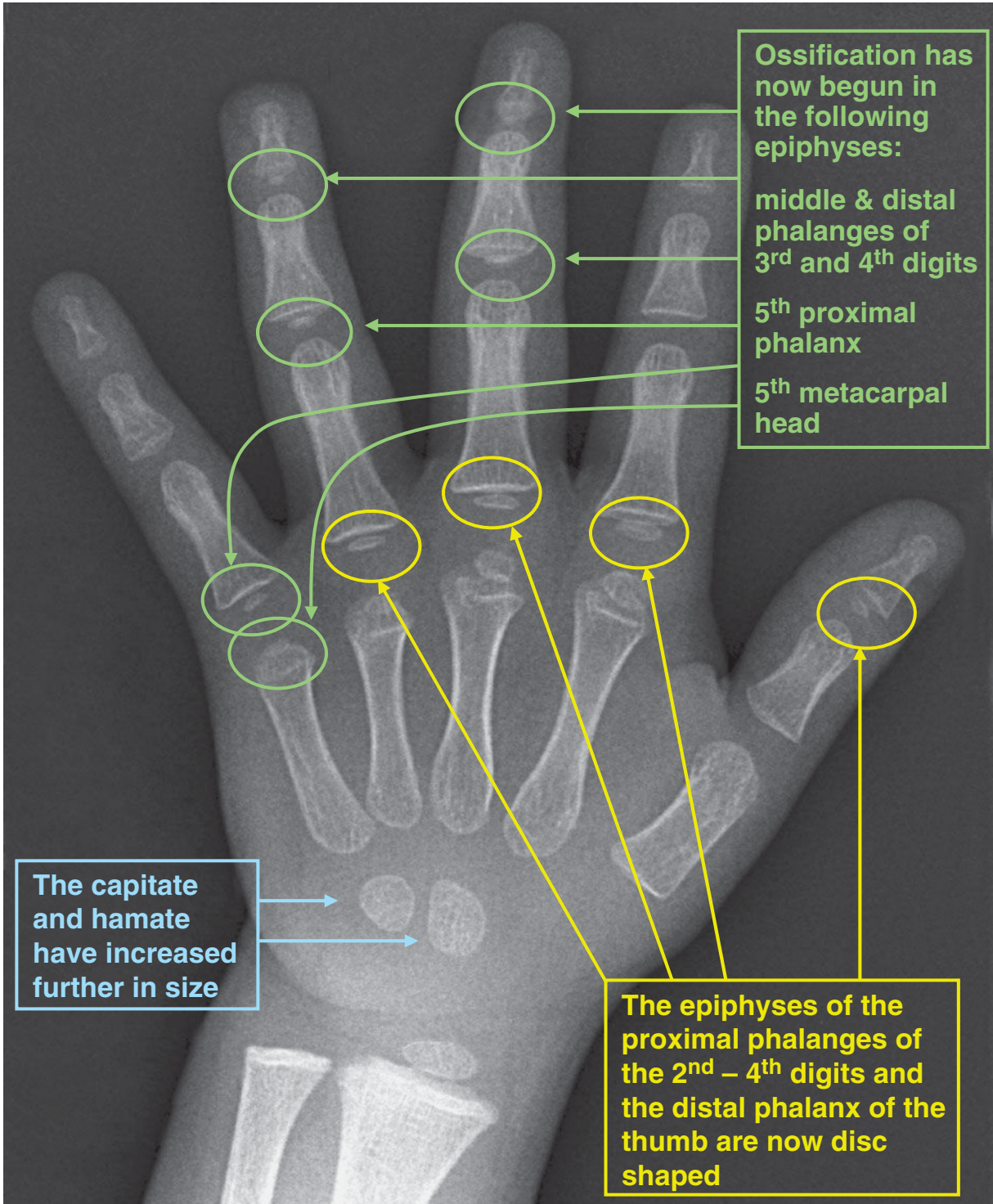
Male

Skeletal Age: 1 Year and 6 Months



Male

Skeletal Age: 2 Years



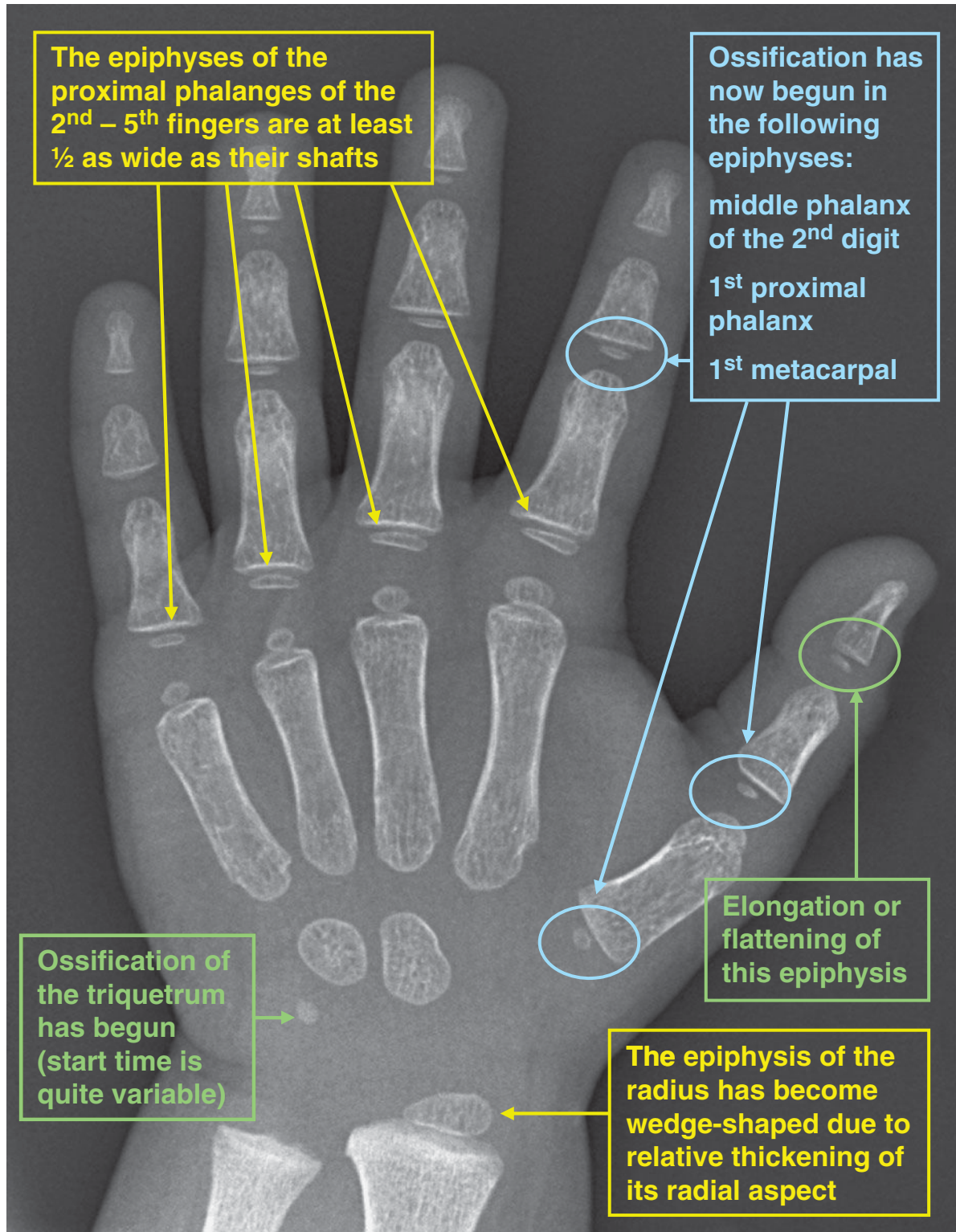
Male

Skeletal Age: 2 Years



Male

Skeletal Age: 2 Years and 8 Months



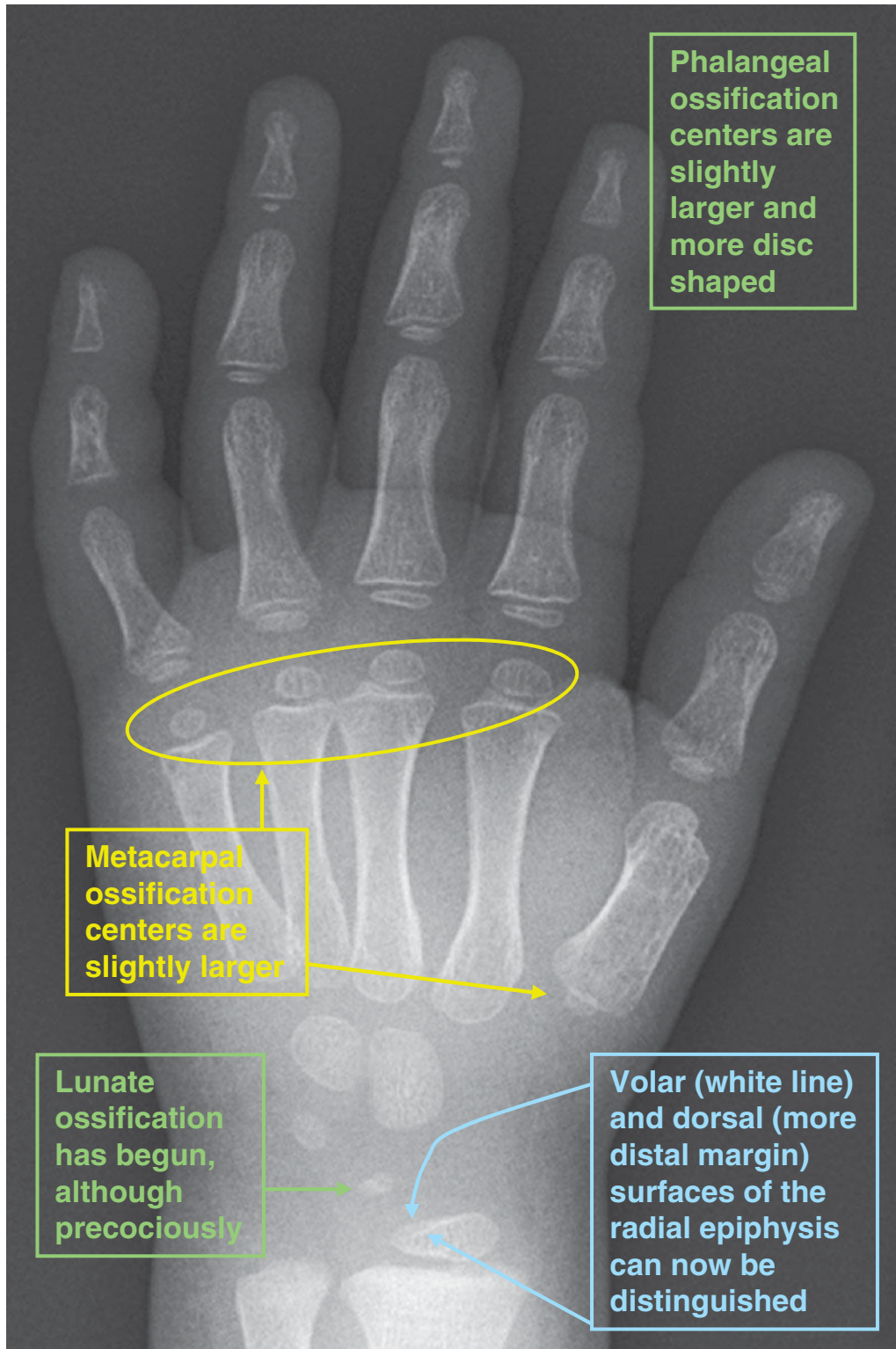
Male

Skeletal Age: 2 Years and 8 Months



Male

Skeletal Age: 3 Years



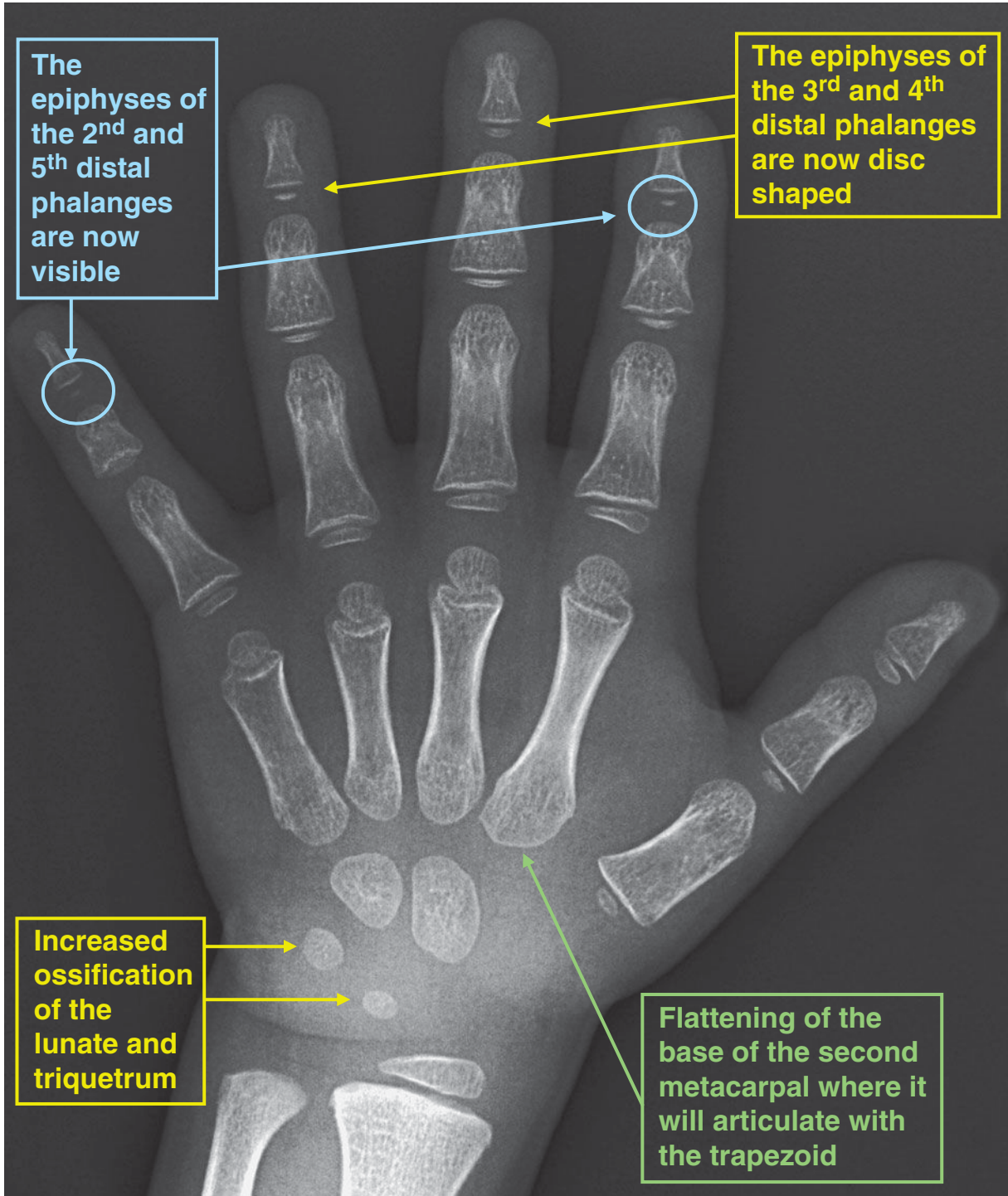
Male

Skeletal Age: 3 Years



Male

Skeletal Age: 3 Years and 6 Months



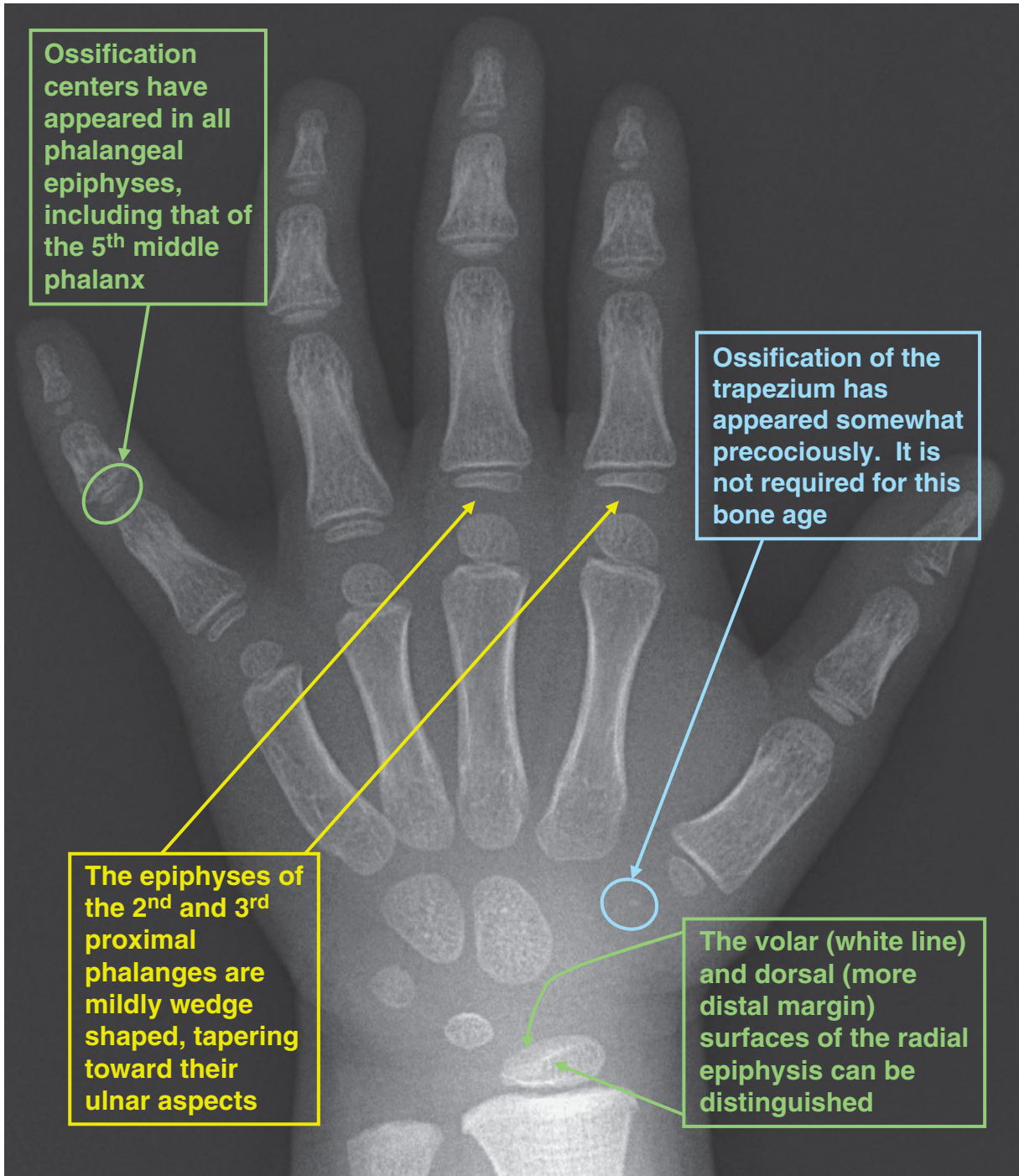
Male

Skeletal Age: 3 Years and 6 Months



Male

Skeletal Age: 4 Years



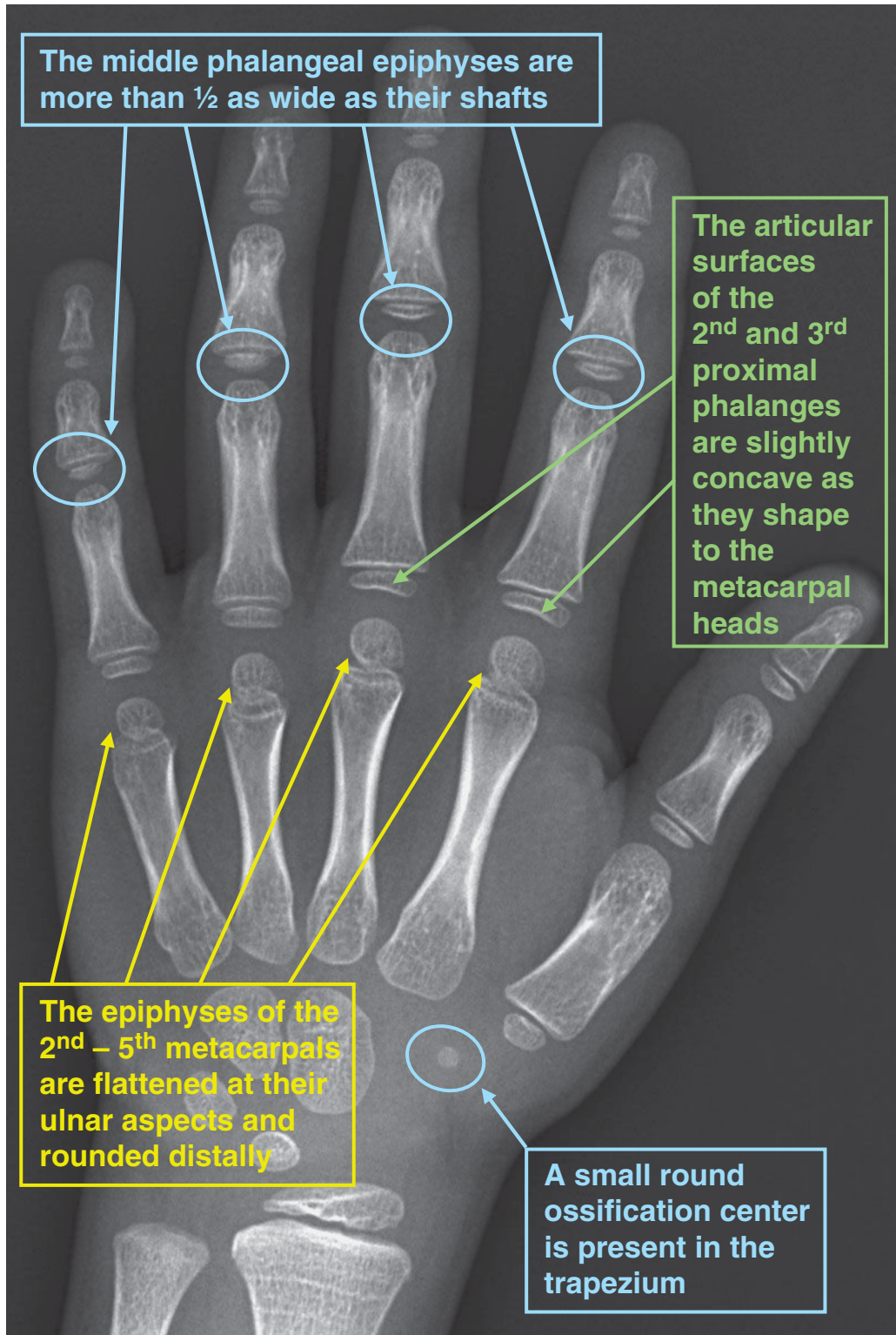
Male

Skeletal Age: 4 Years



Male

Skeletal Age: 4 Years and 6 Months



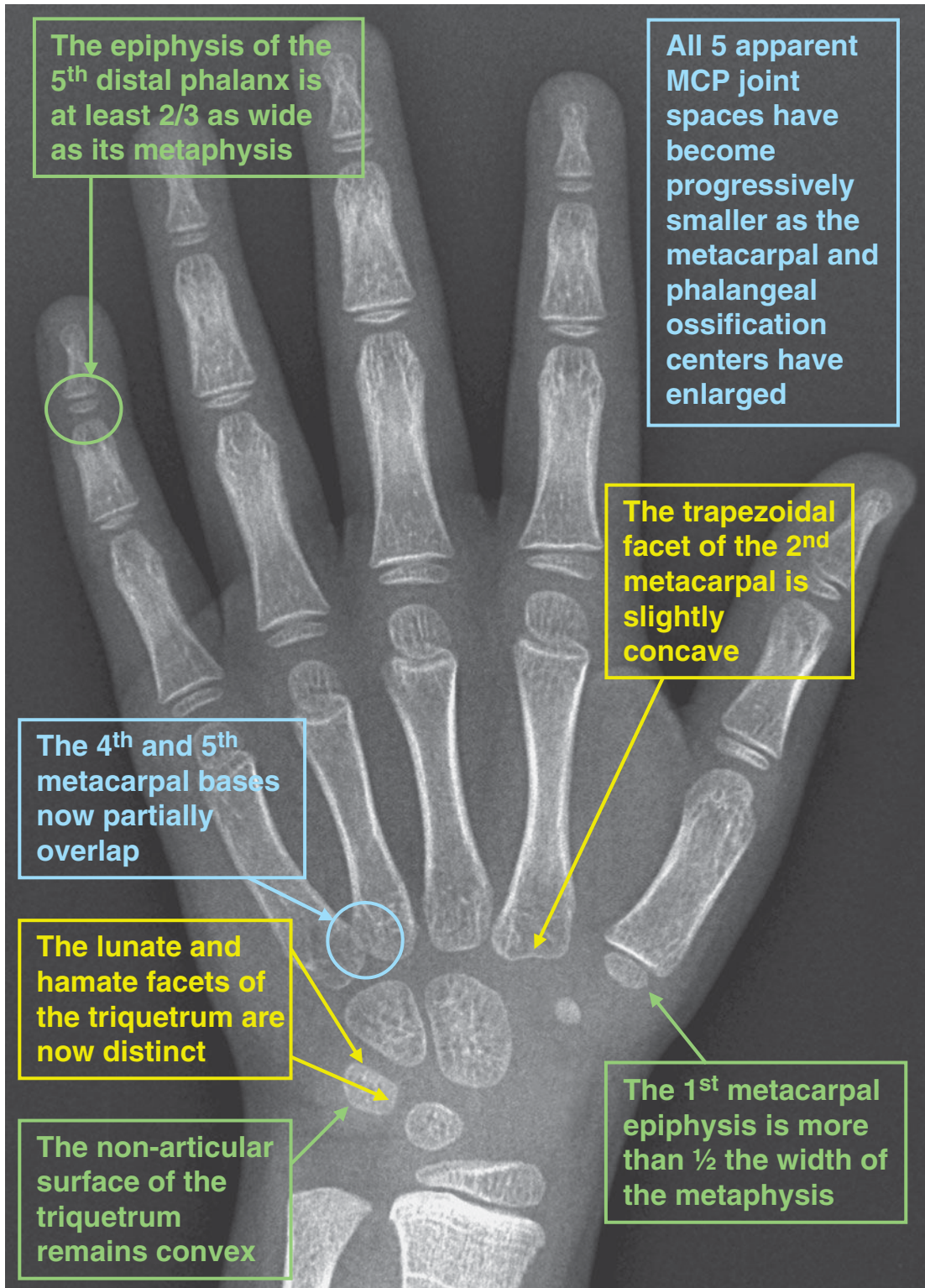
Male

Skeletal Age: 4 Years and 6 Months



Male

Skeletal Age: 5 Years



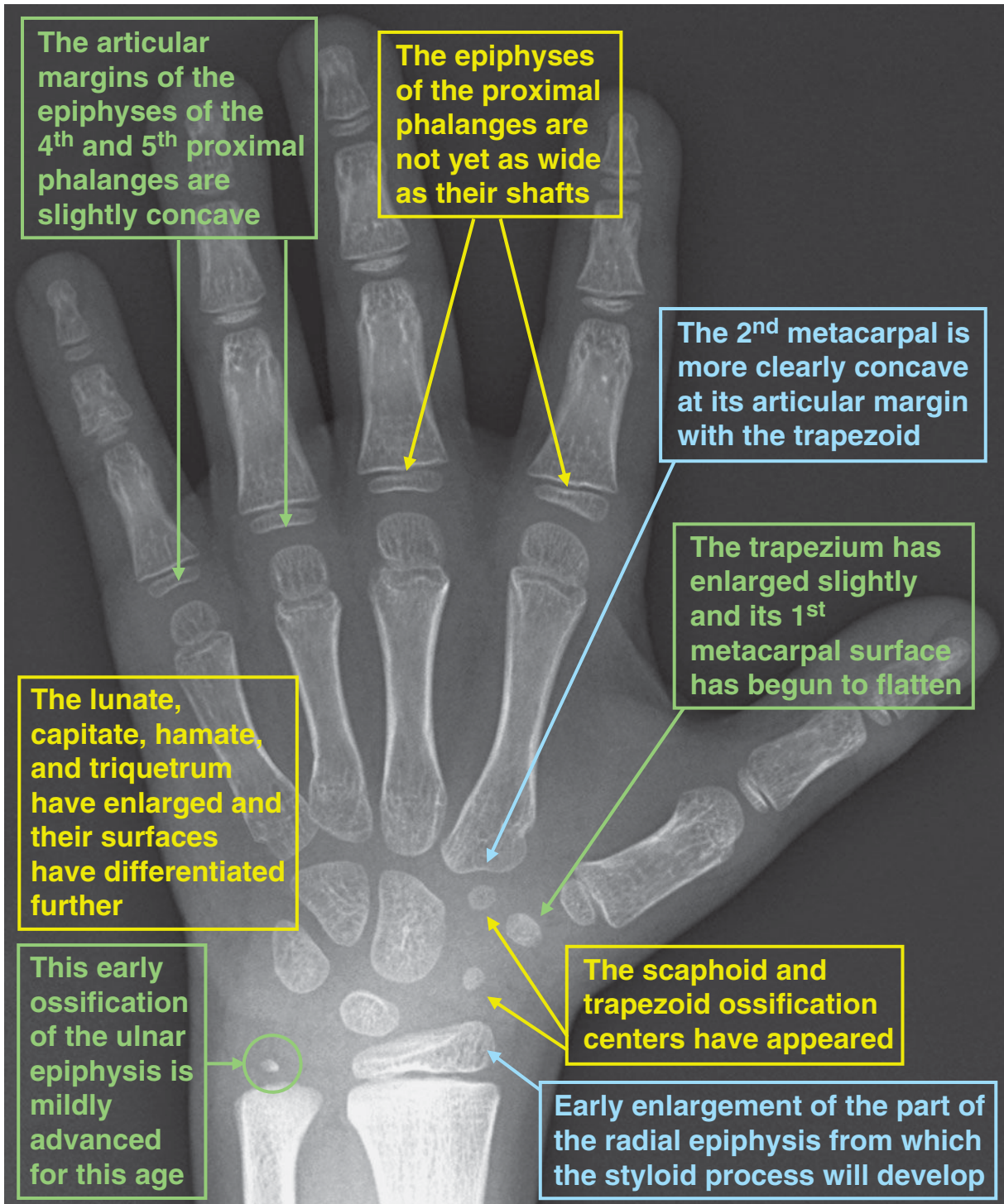
Male

Skeletal Age: 5 Years



Male

Skeletal Age: 6 Years



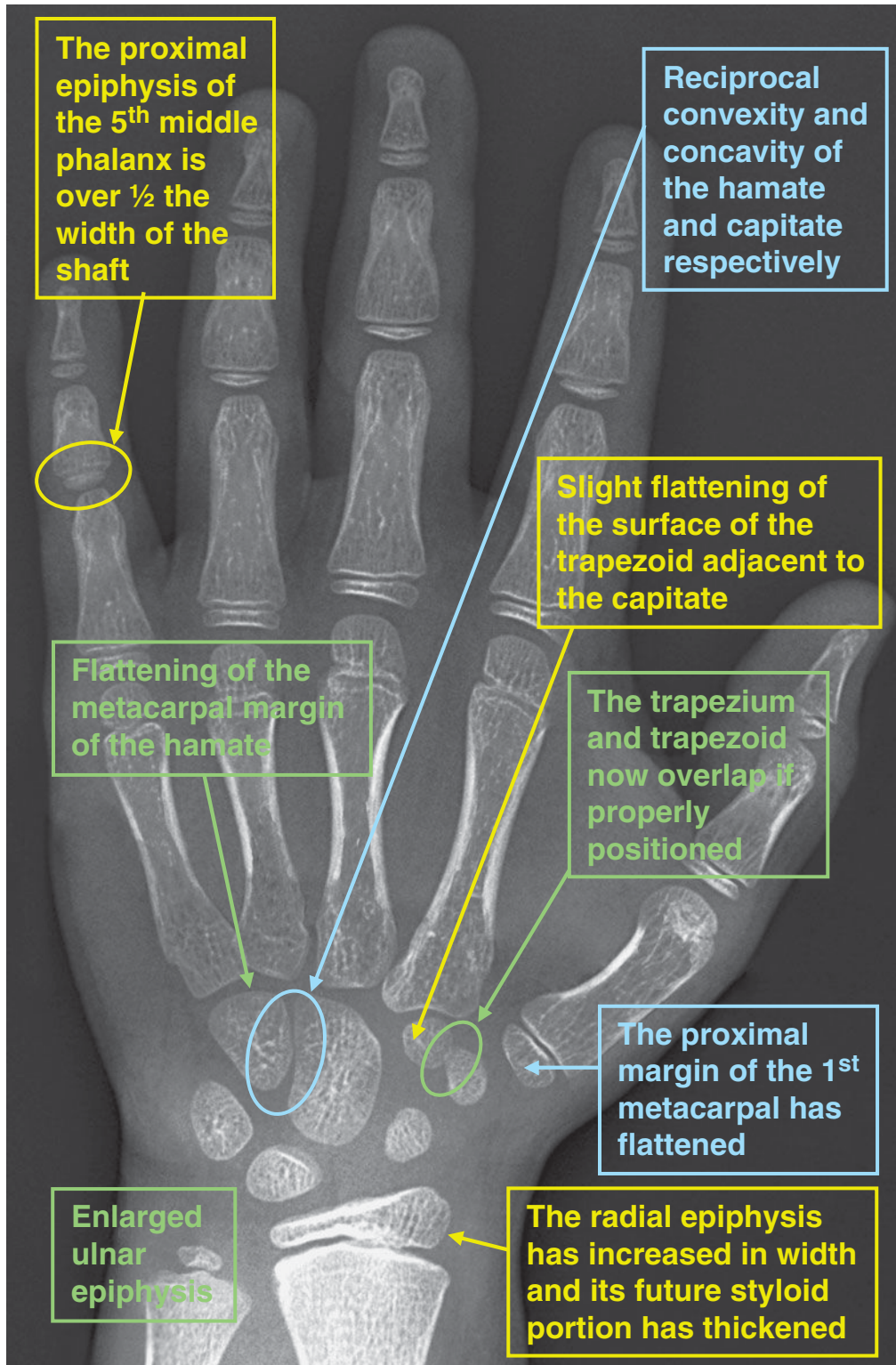
Male

Skeletal Age: 6 Years



Male

Skeletal Age: 7 Years



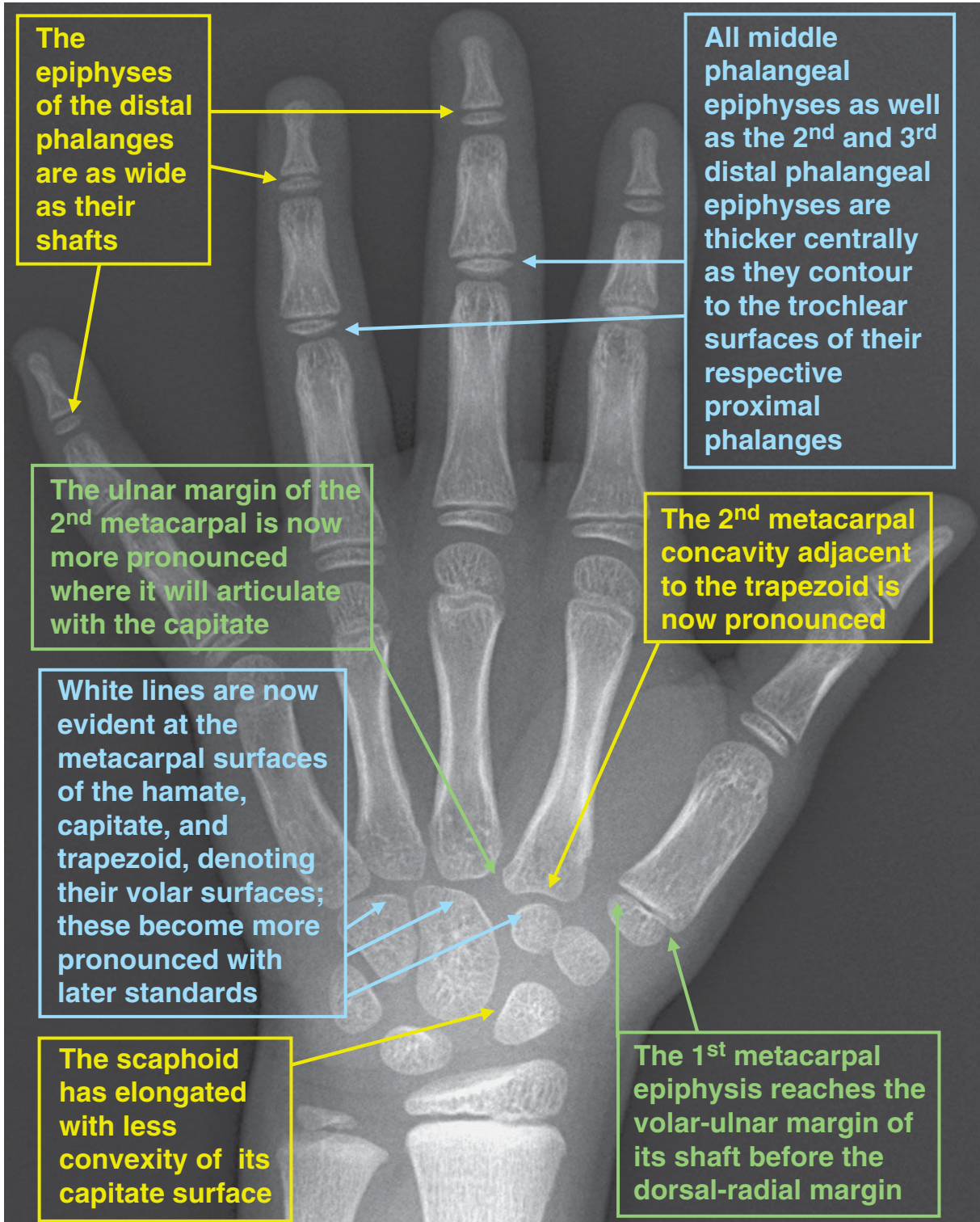
Male

Skeletal Age: 7 Years



Male

Skeletal Age: 8 Years



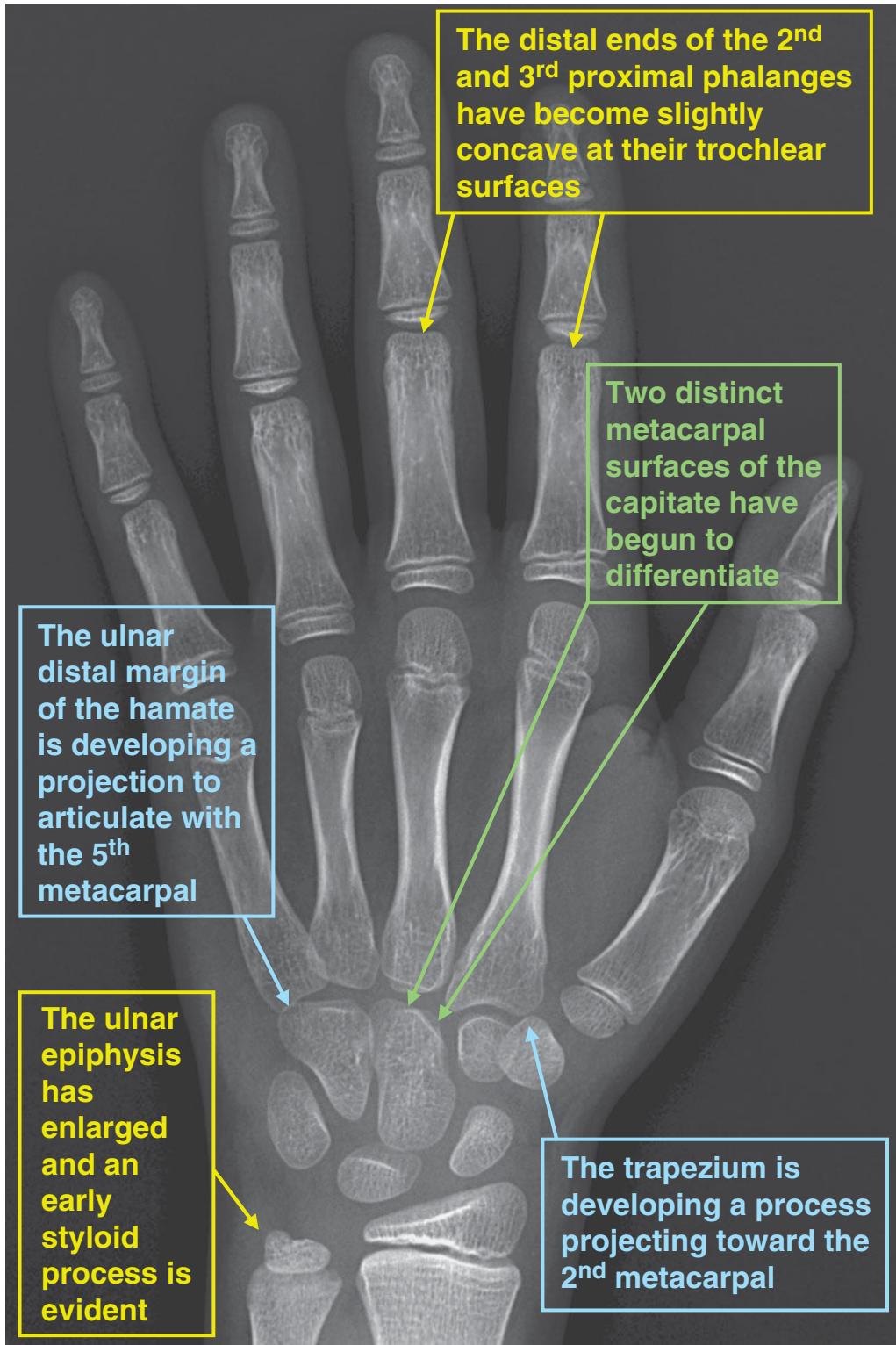
Male

Skeletal Age: 8 Years



Male

Skeletal Age: 9 Years



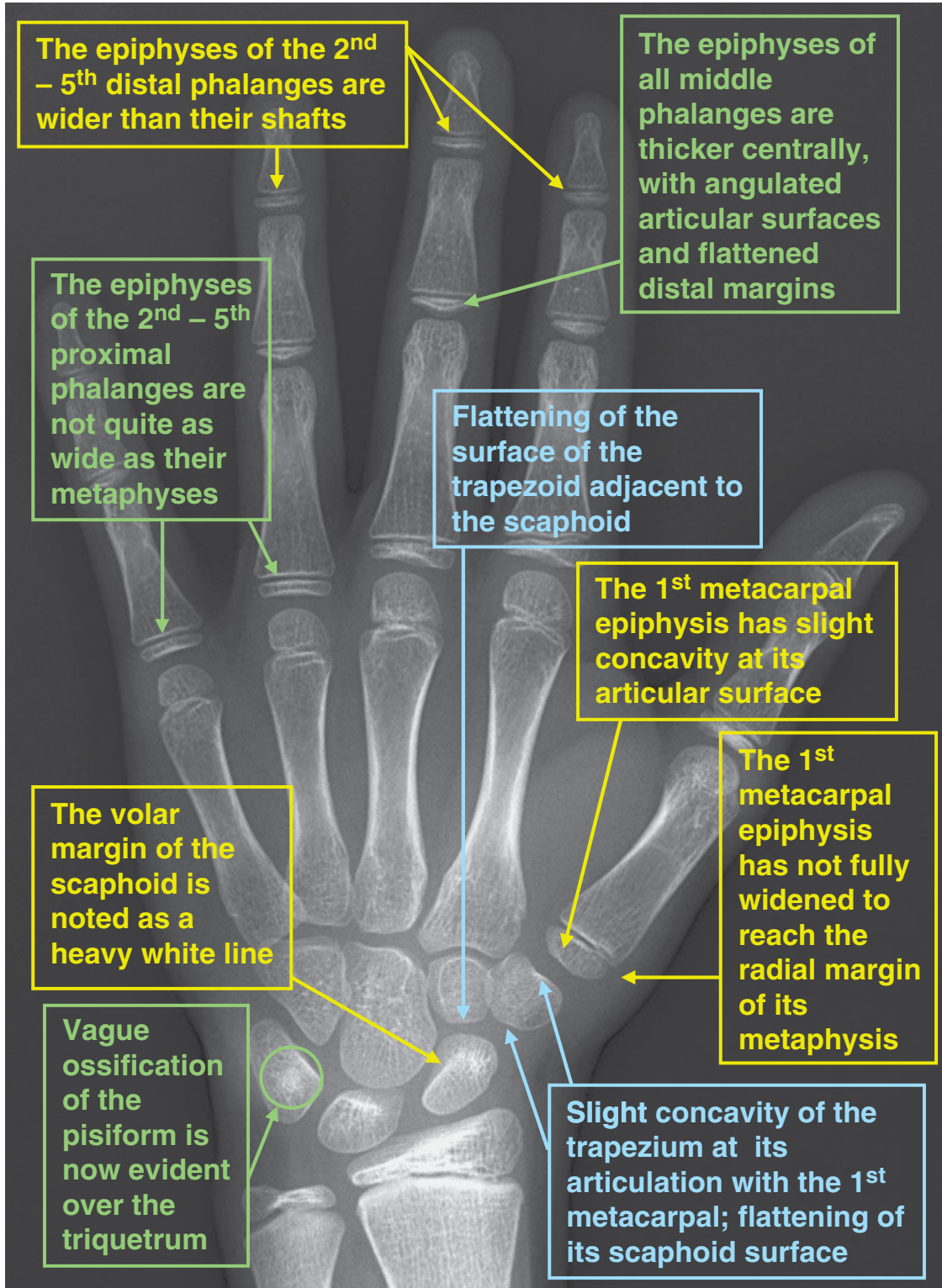
Male

Skeletal Age: 9 Years



Male

Skeletal Age: 10 Years



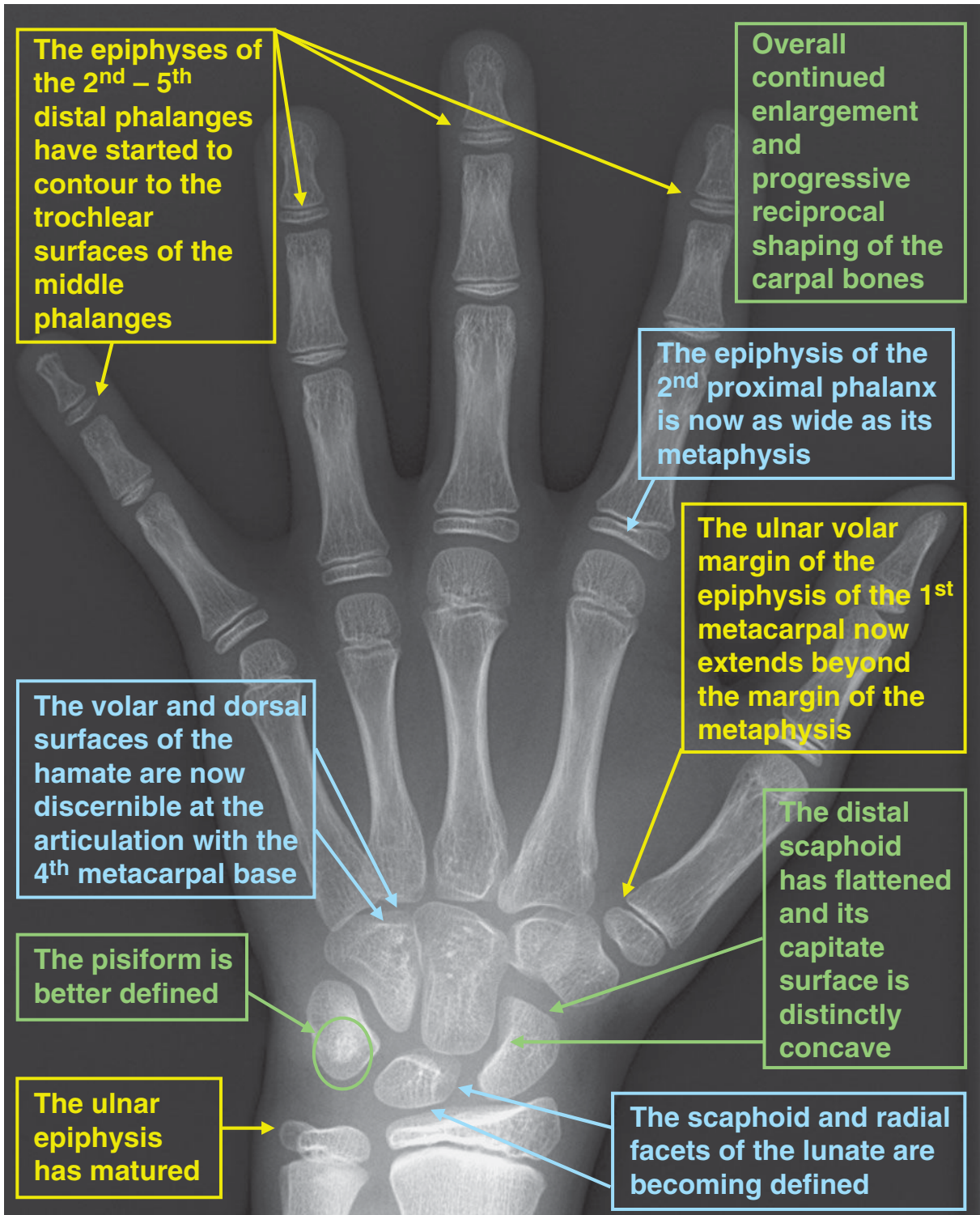
Male

Skeletal Age: 10 Years



Male

Skeletal Age: 11 Years



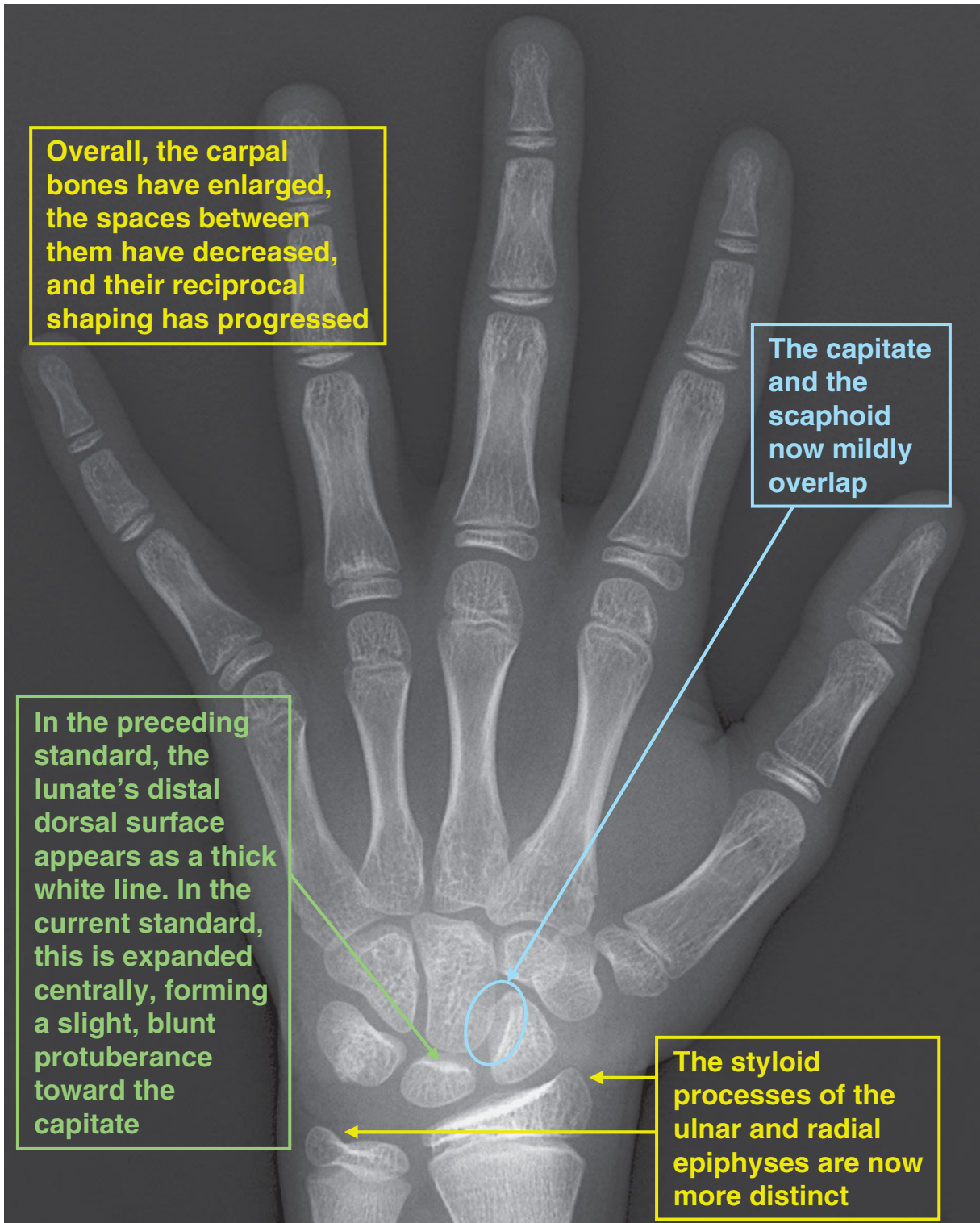
Male

Skeletal Age: 11 Years



Male

Skeletal Age: 11 Years and 6 Months



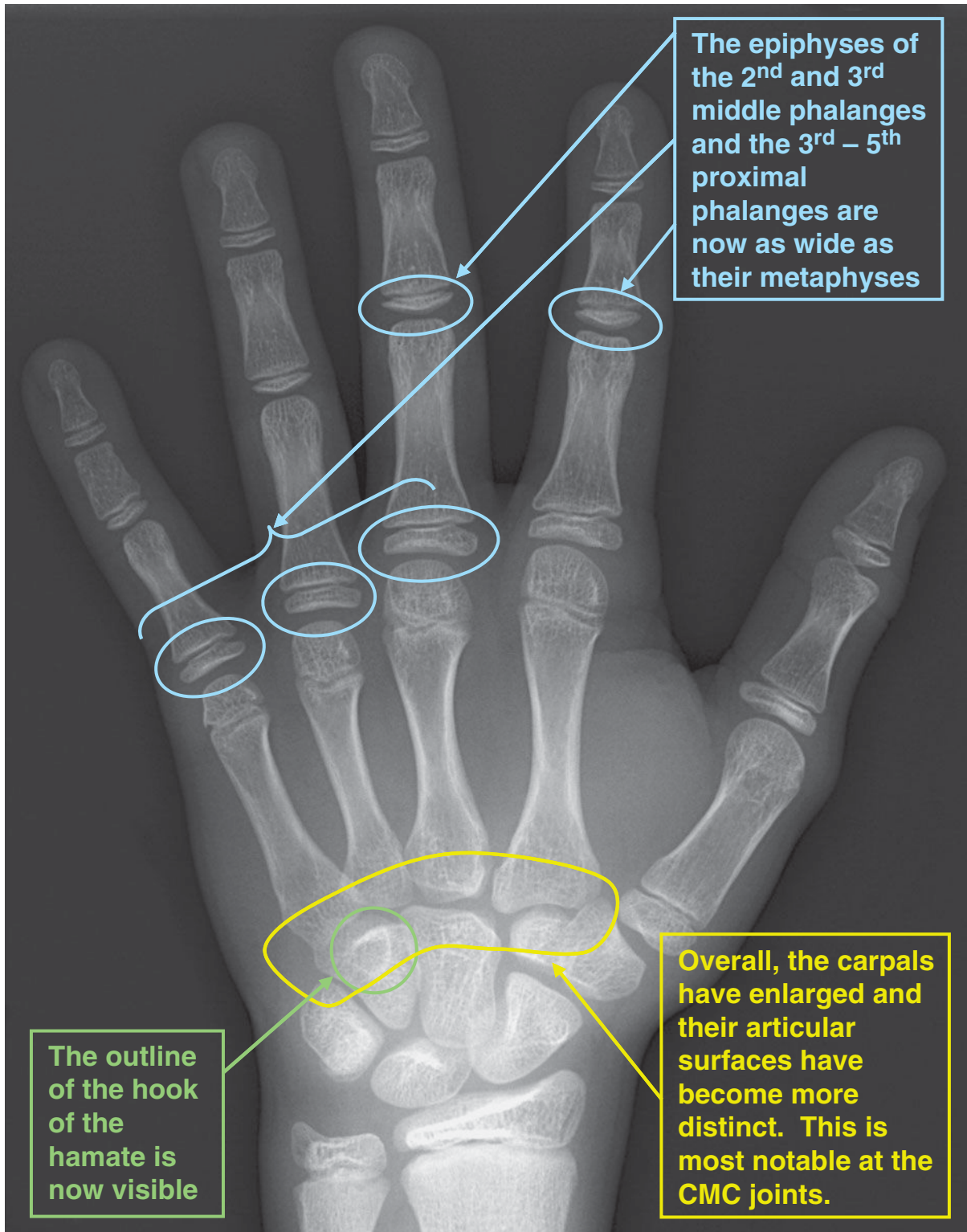
Male

Skeletal Age: 11 Years and 6 Months



Male

Skeletal Age: 12 Years and 6 Months



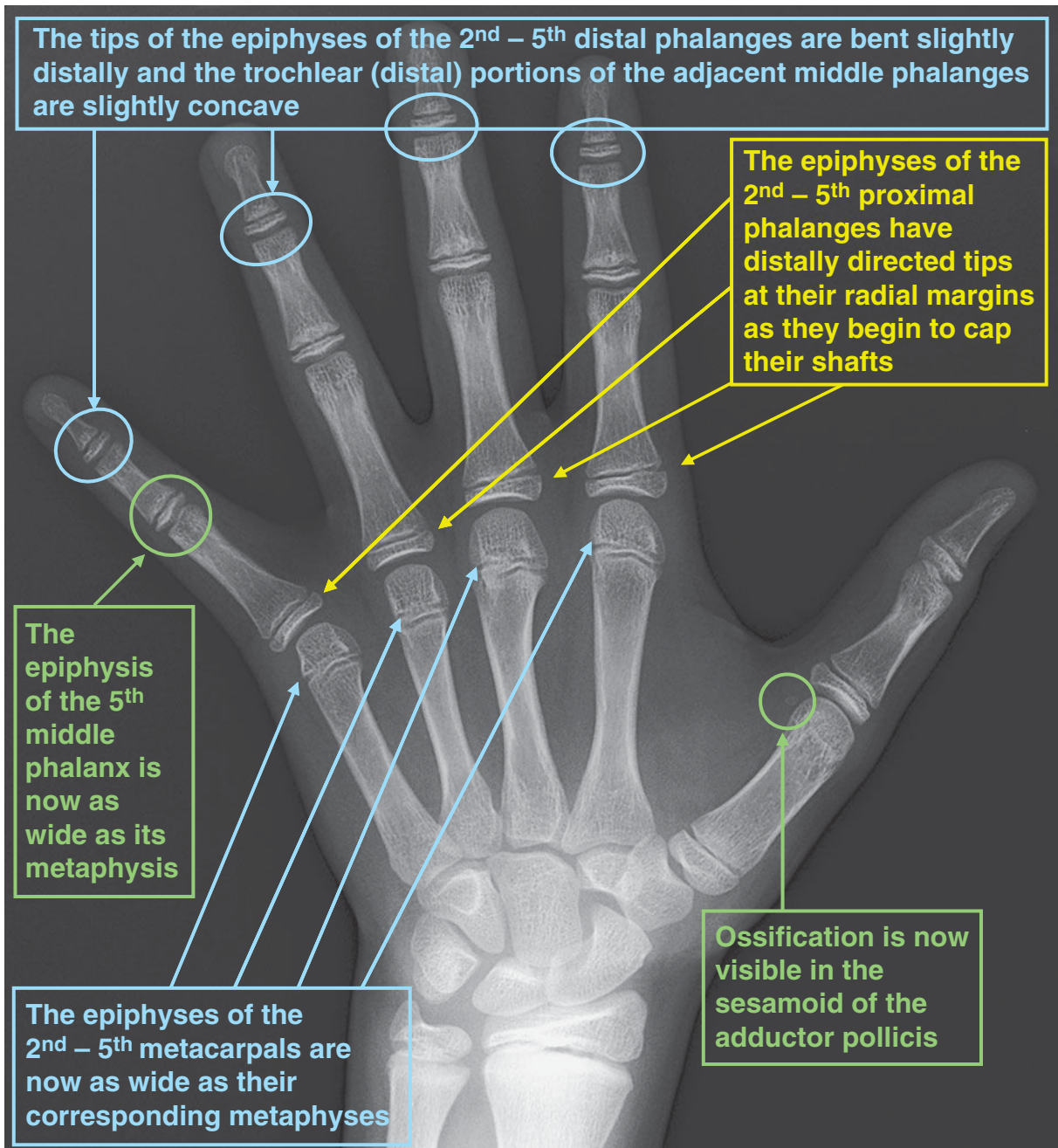
Male

Skeletal Age: 12 Years and 6 Months



Male

Skeletal Age: 13 Years



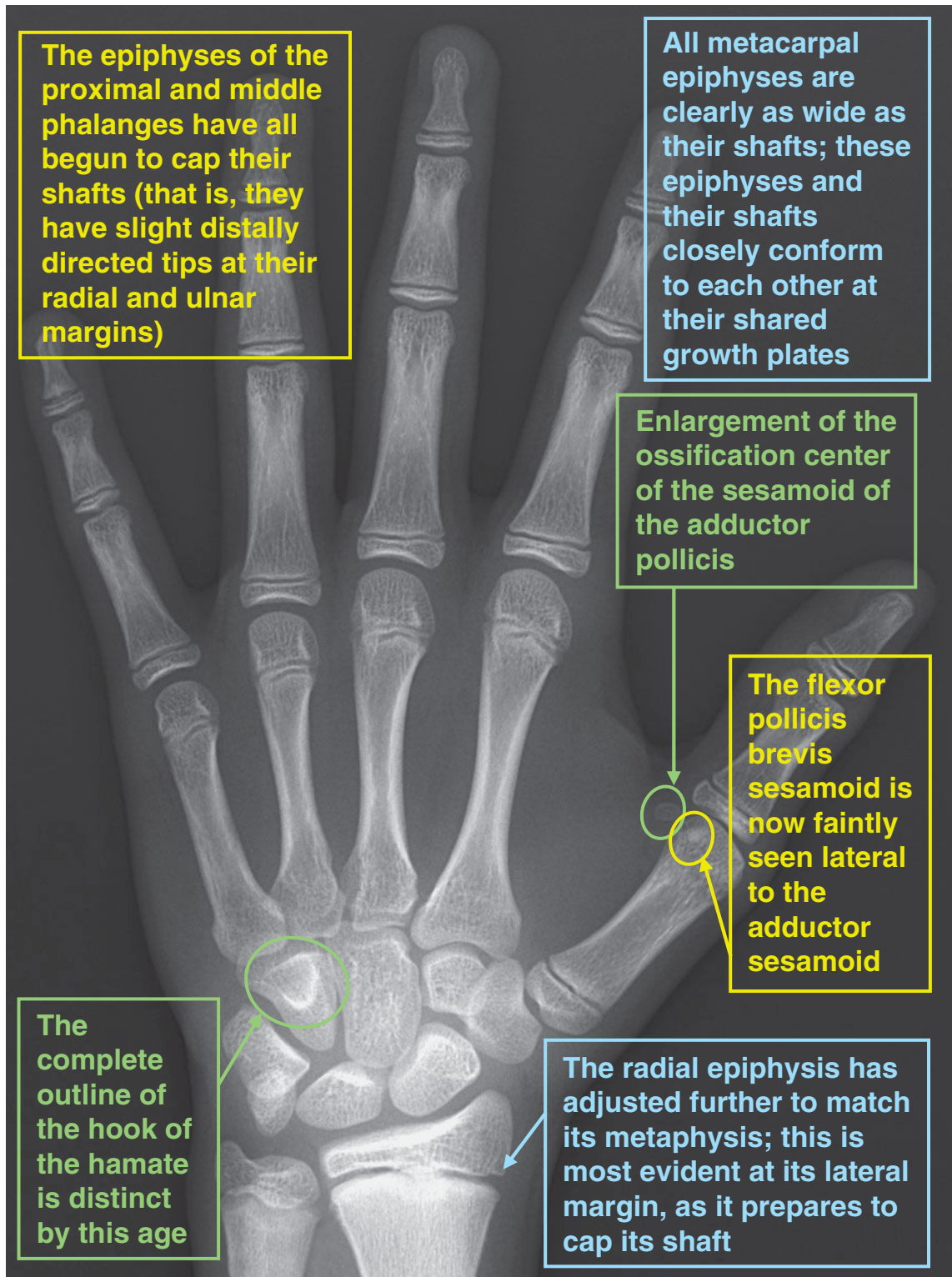
Male

Skeletal Age: 13 Years



Male

Skeletal Age: 13 Years and 6 Months



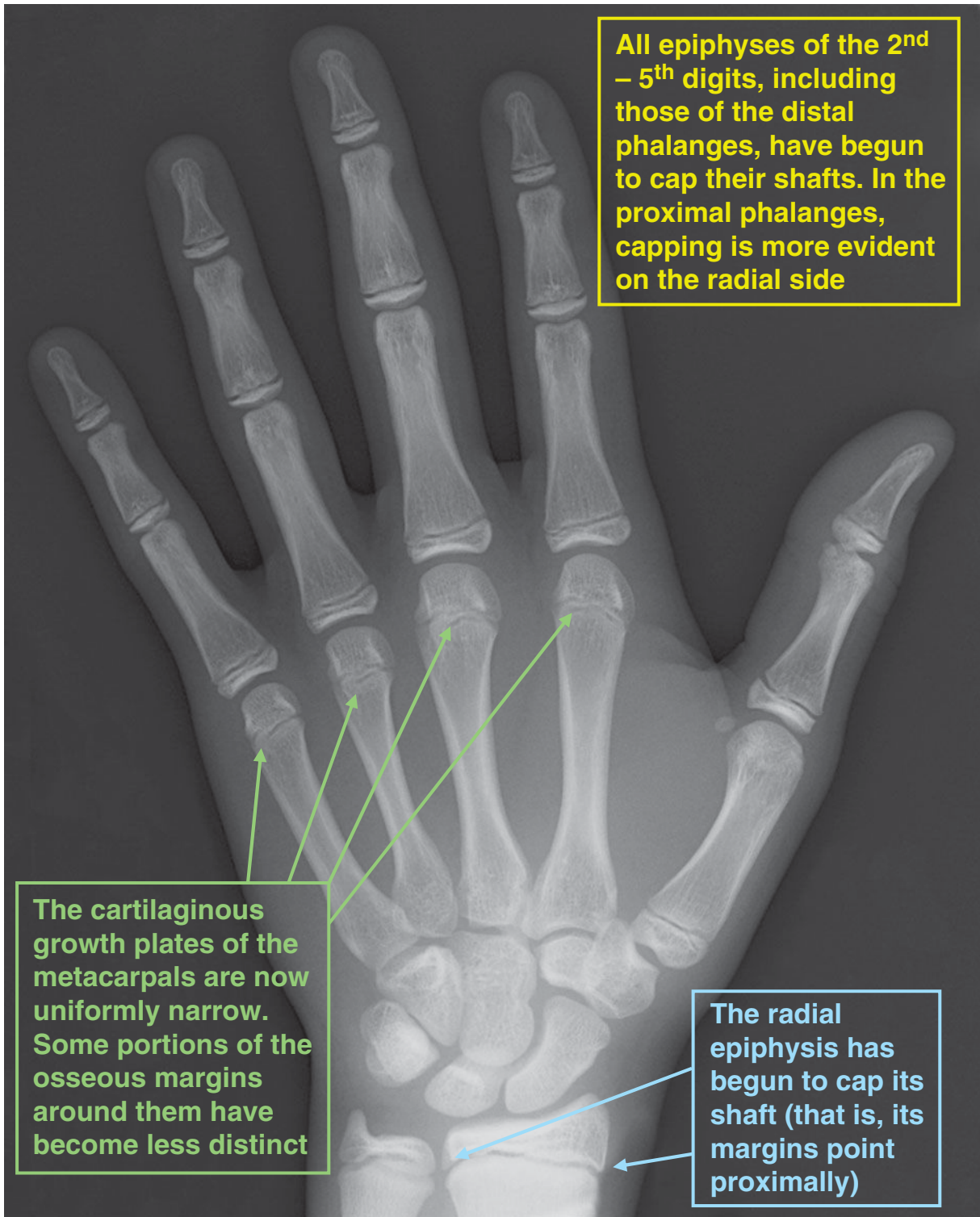
Male

Skeletal Age: 13 Years and 6 Months



Male

Skeletal Age: 14 Years



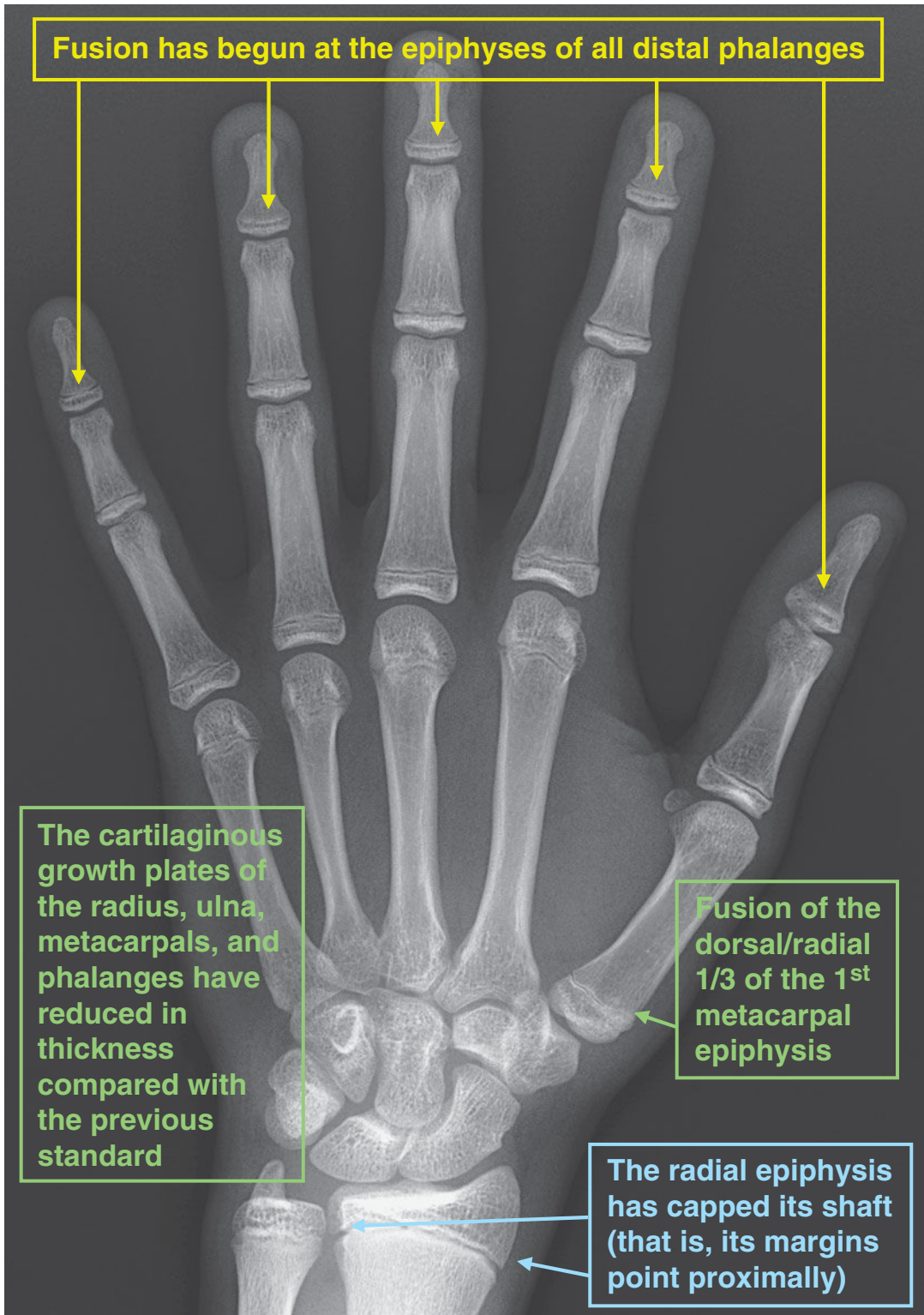
Male

Skeletal Age: 14 Years



Male

Skeletal Age: 15 Years



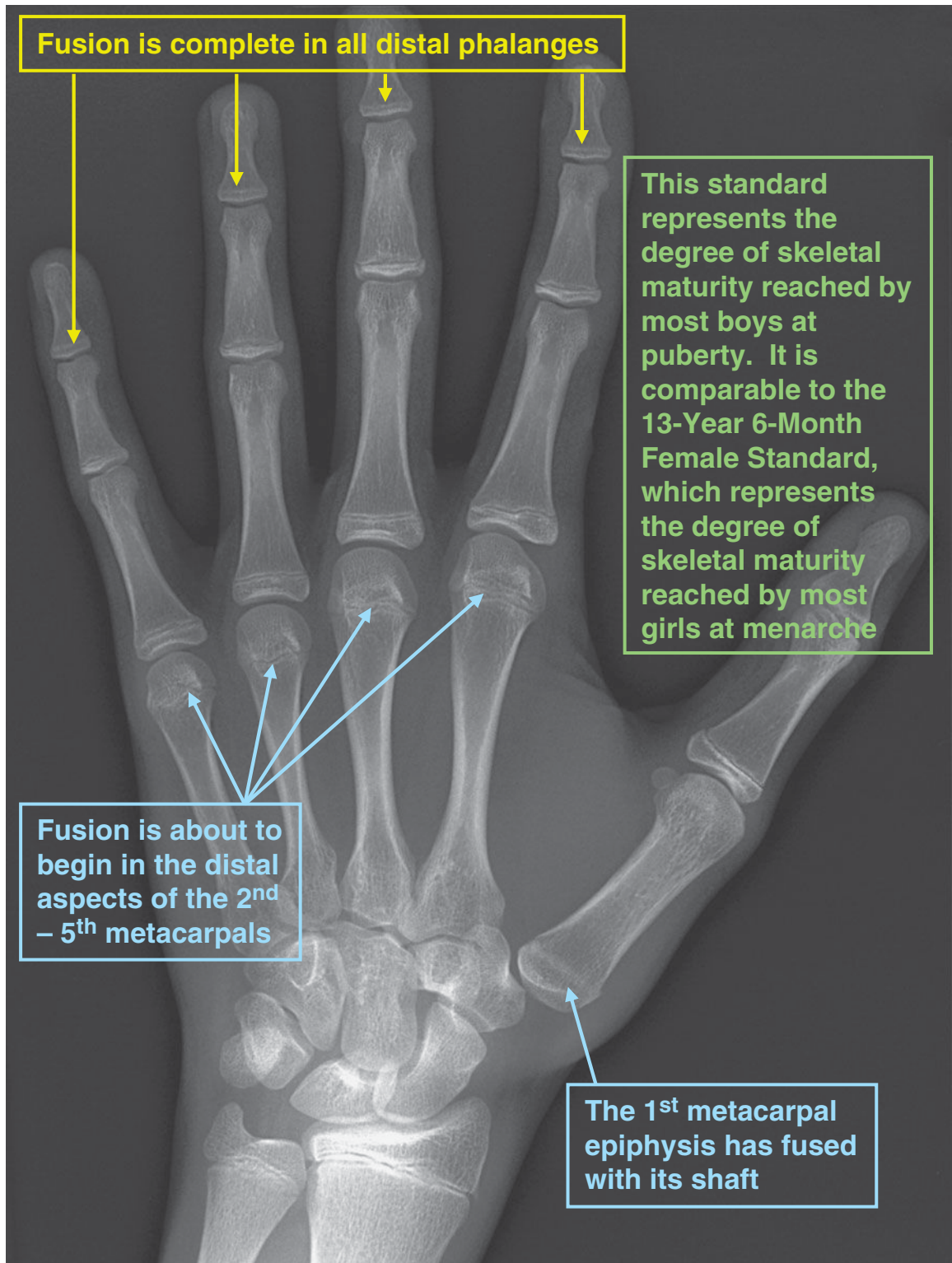
Male

Skeletal Age: 15 Years



Male

Skeletal Age: 15 Years and 6 Months



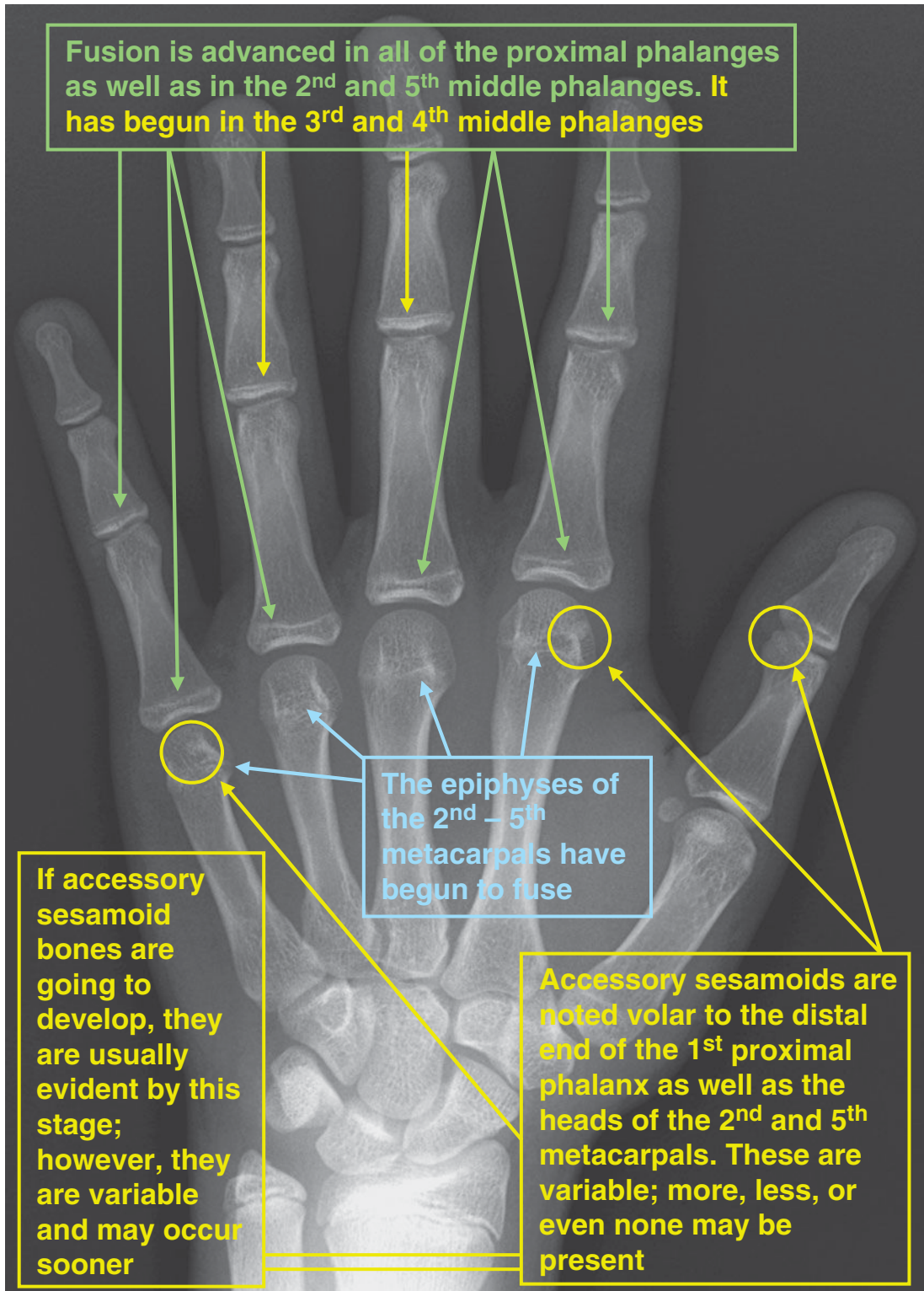
Male

Skeletal Age: 15 Years and 6 Months



Male

Skeletal Age: 16 Years



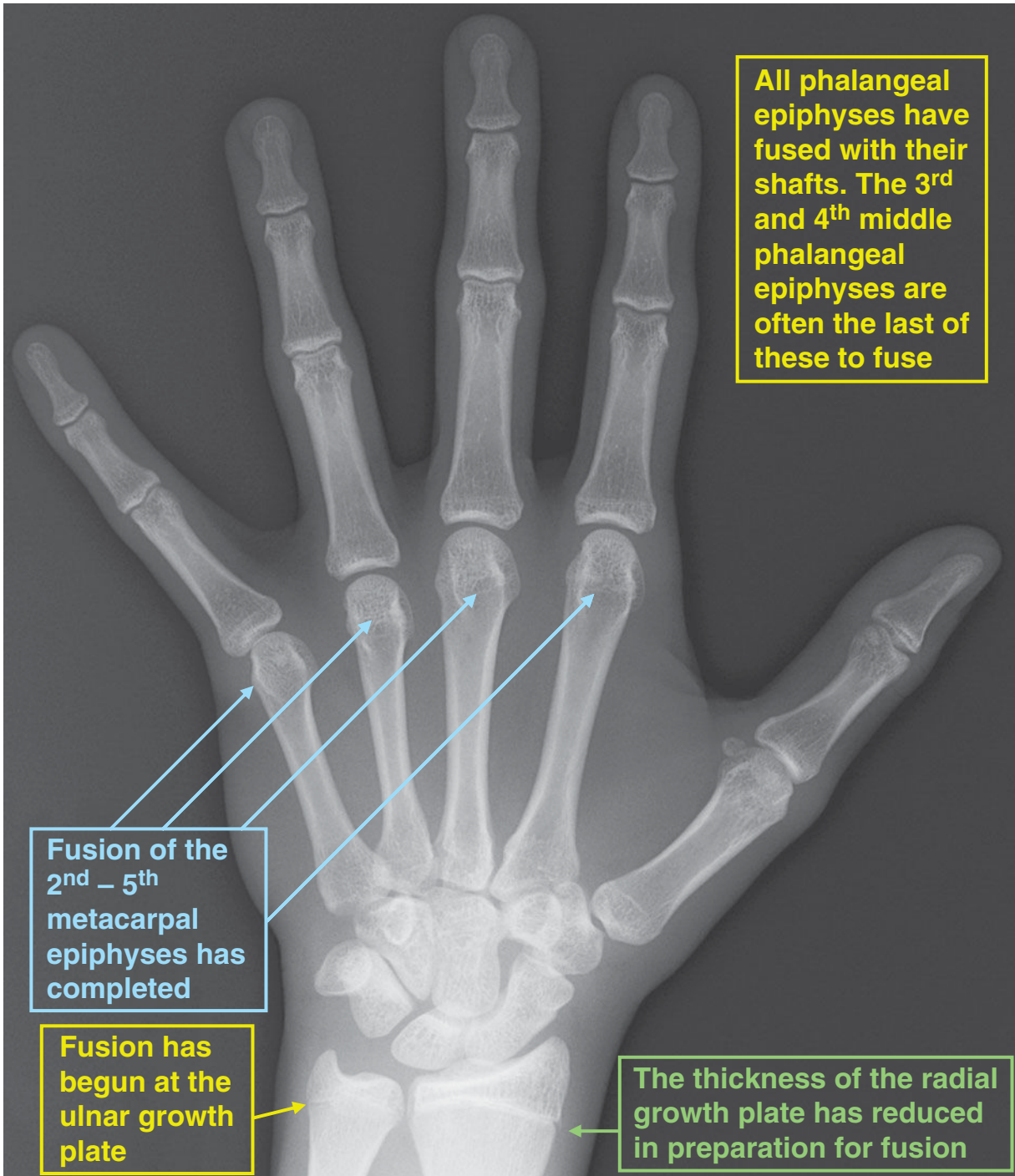
Male

Skeletal Age: 16 Years



Male

Skeletal Age: 17 Years



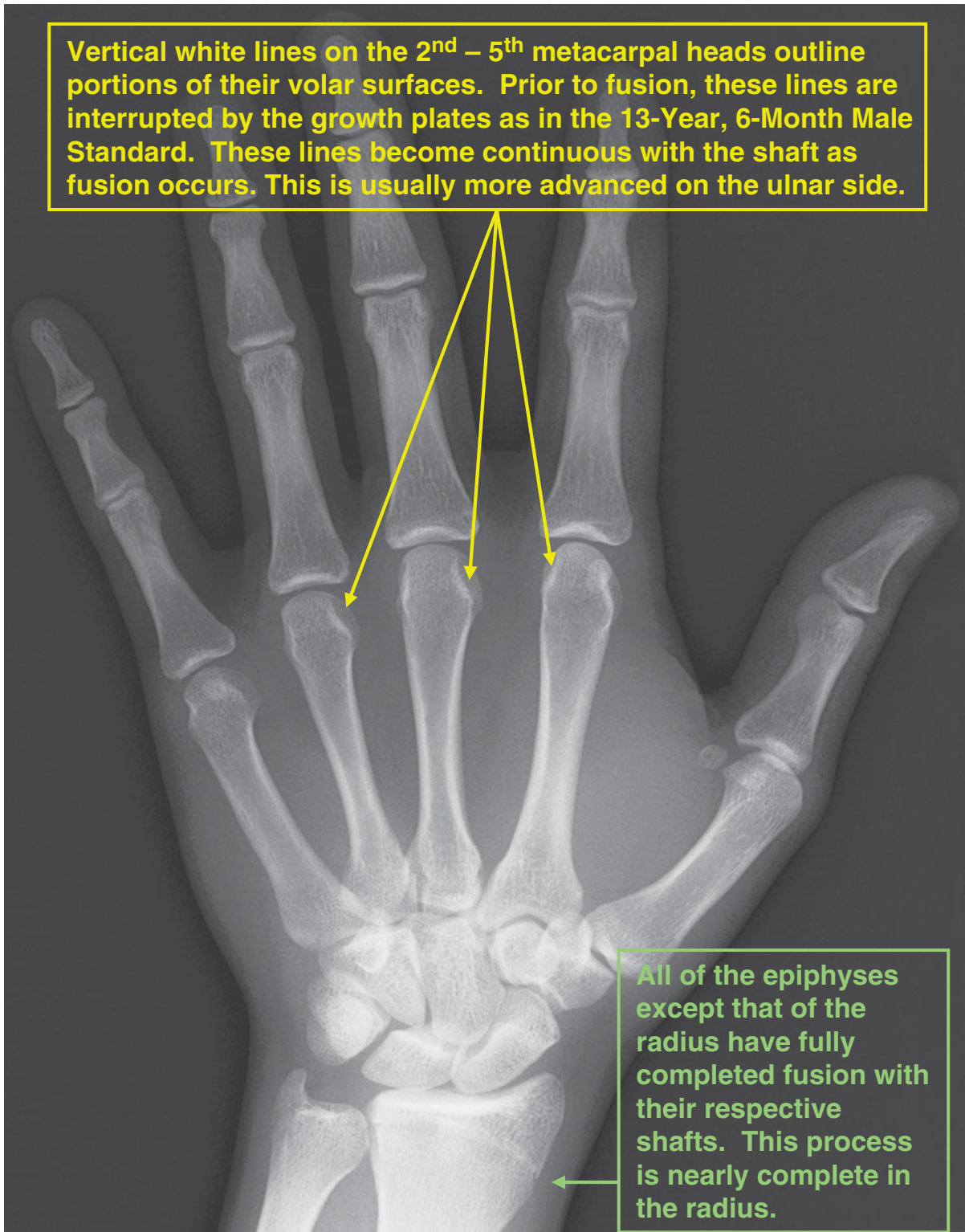
Male

Skeletal Age: 17 Years



Male

Skeletal Age: 18 Years



Male

Skeletal Age: 18 Years



Male

Skeletal Age: 19 Years



Male

Skeletal Age: 19 Years



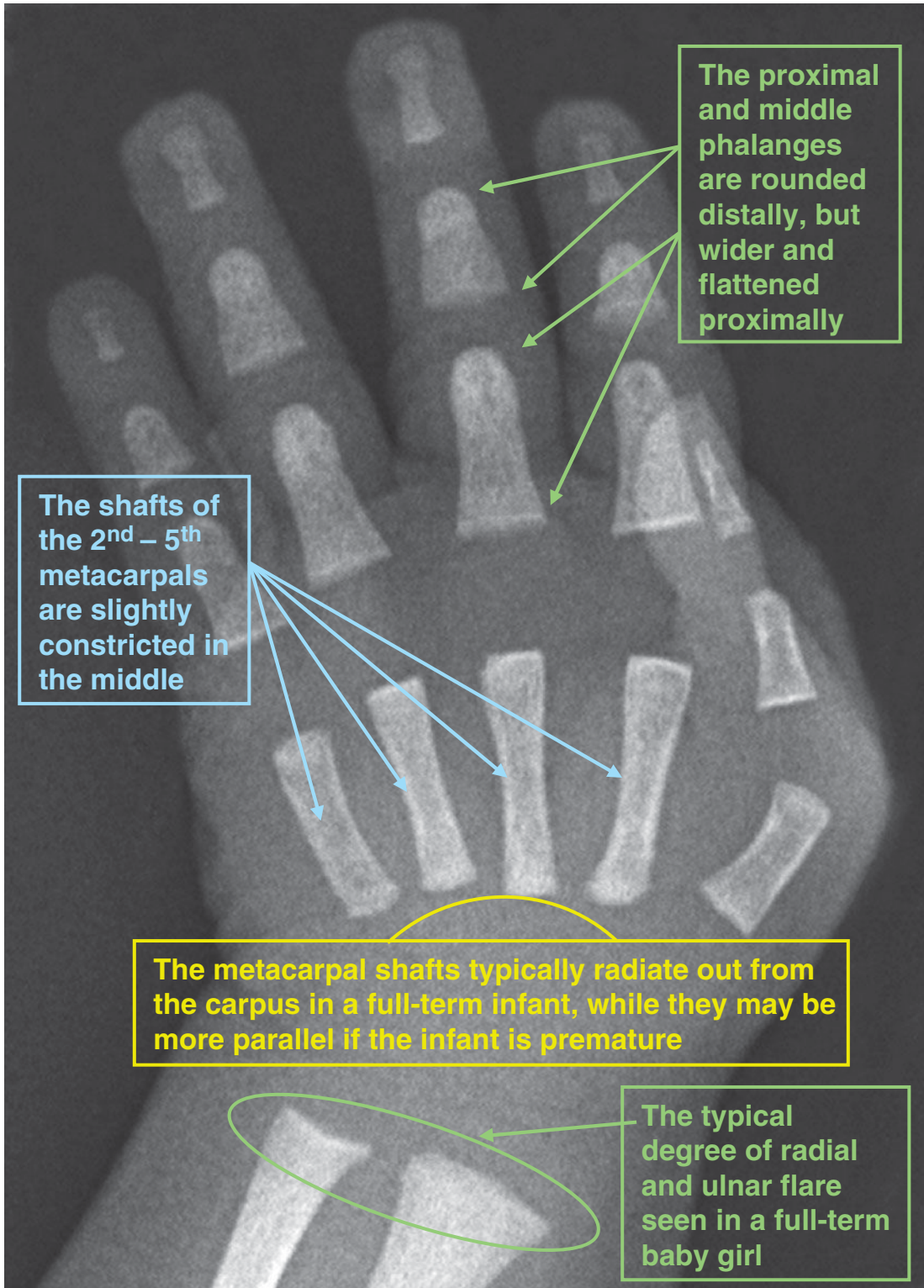
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Female Standards

4

Female

Skeletal Age: Newborn (term)



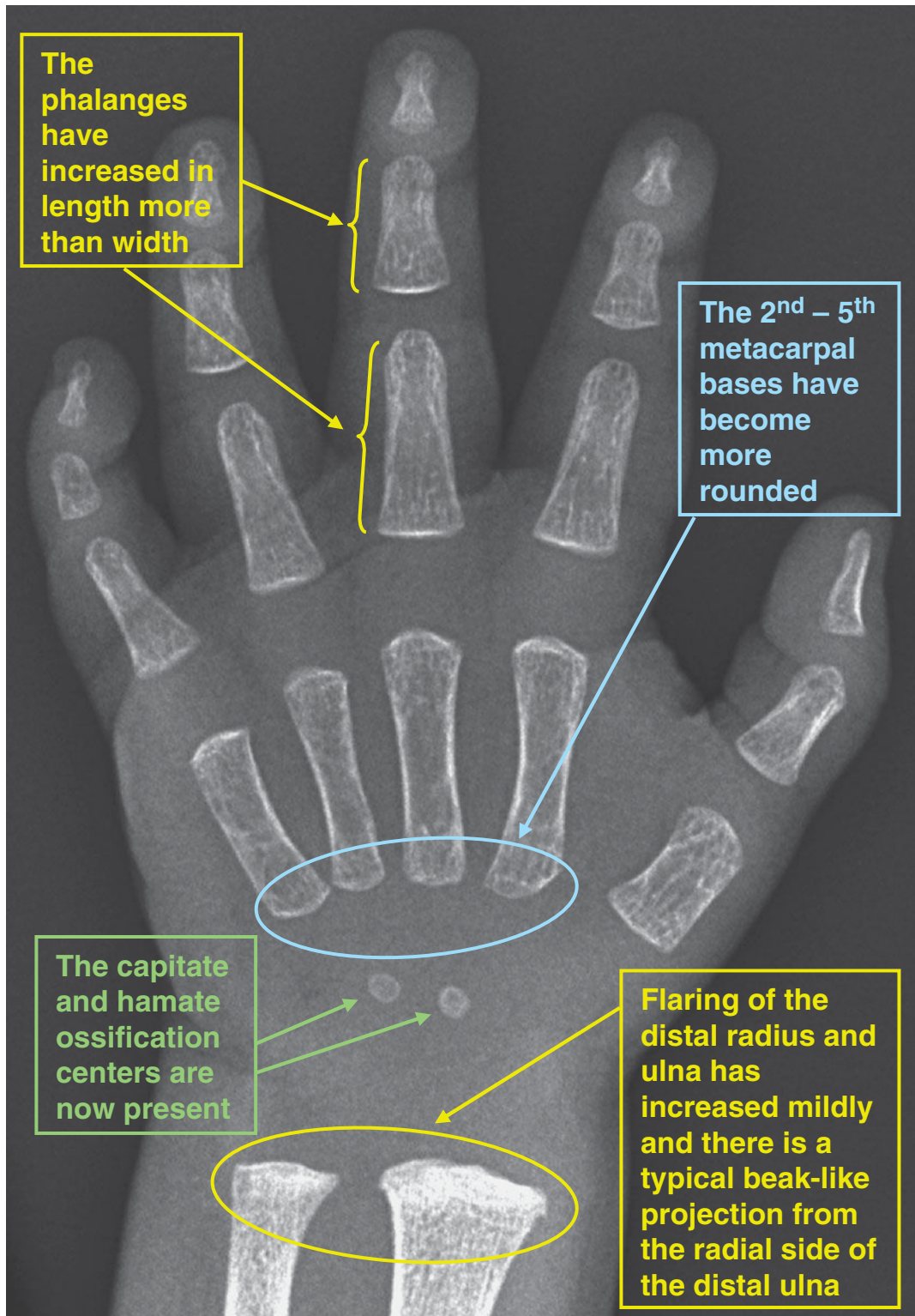
Female

Skeletal Age: Newborn (term)



Female

Skeletal Age: 3 Months



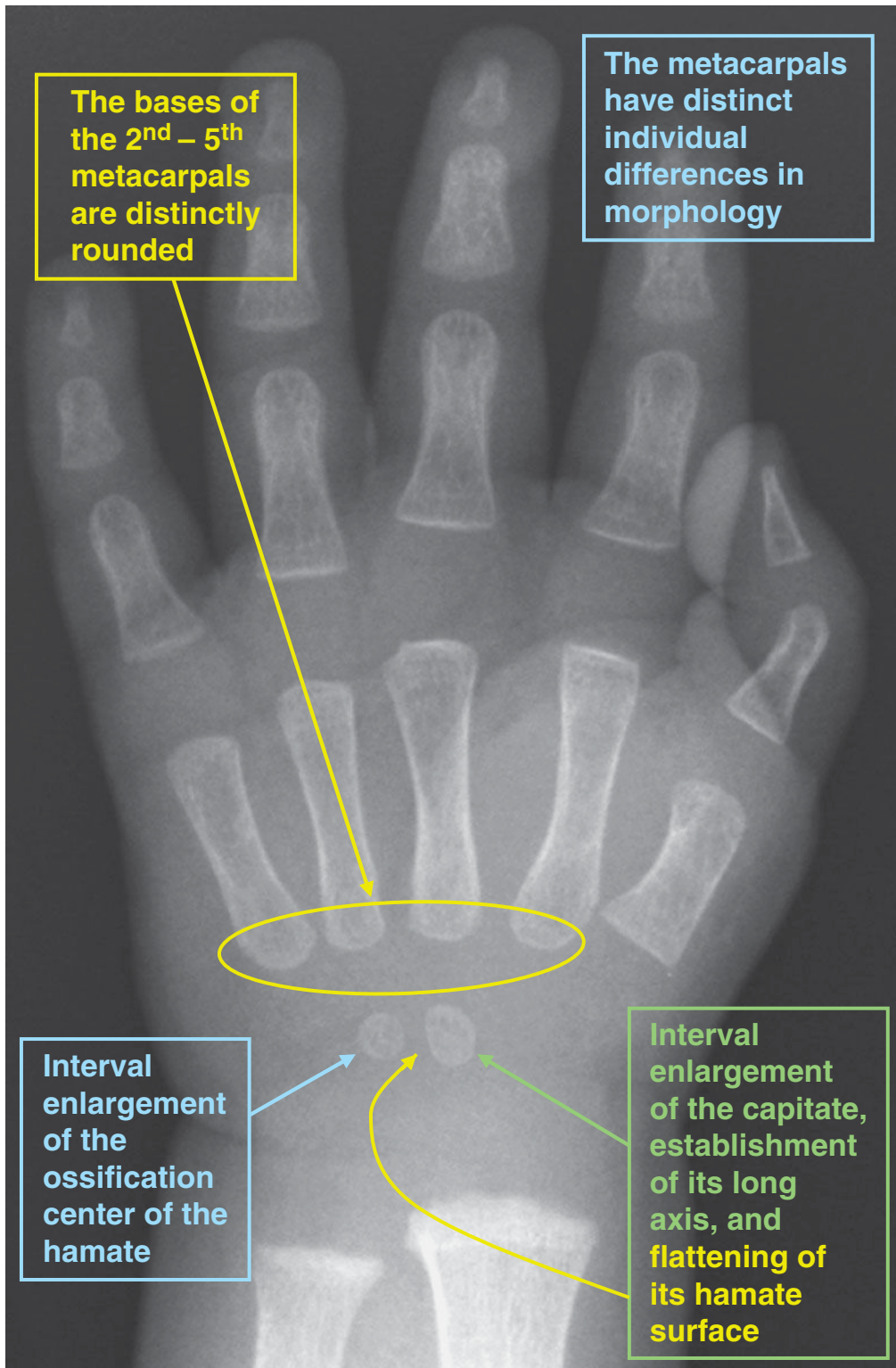
Female

Skeletal Age: 3 Months



Female

Skeletal Age: 6 Months



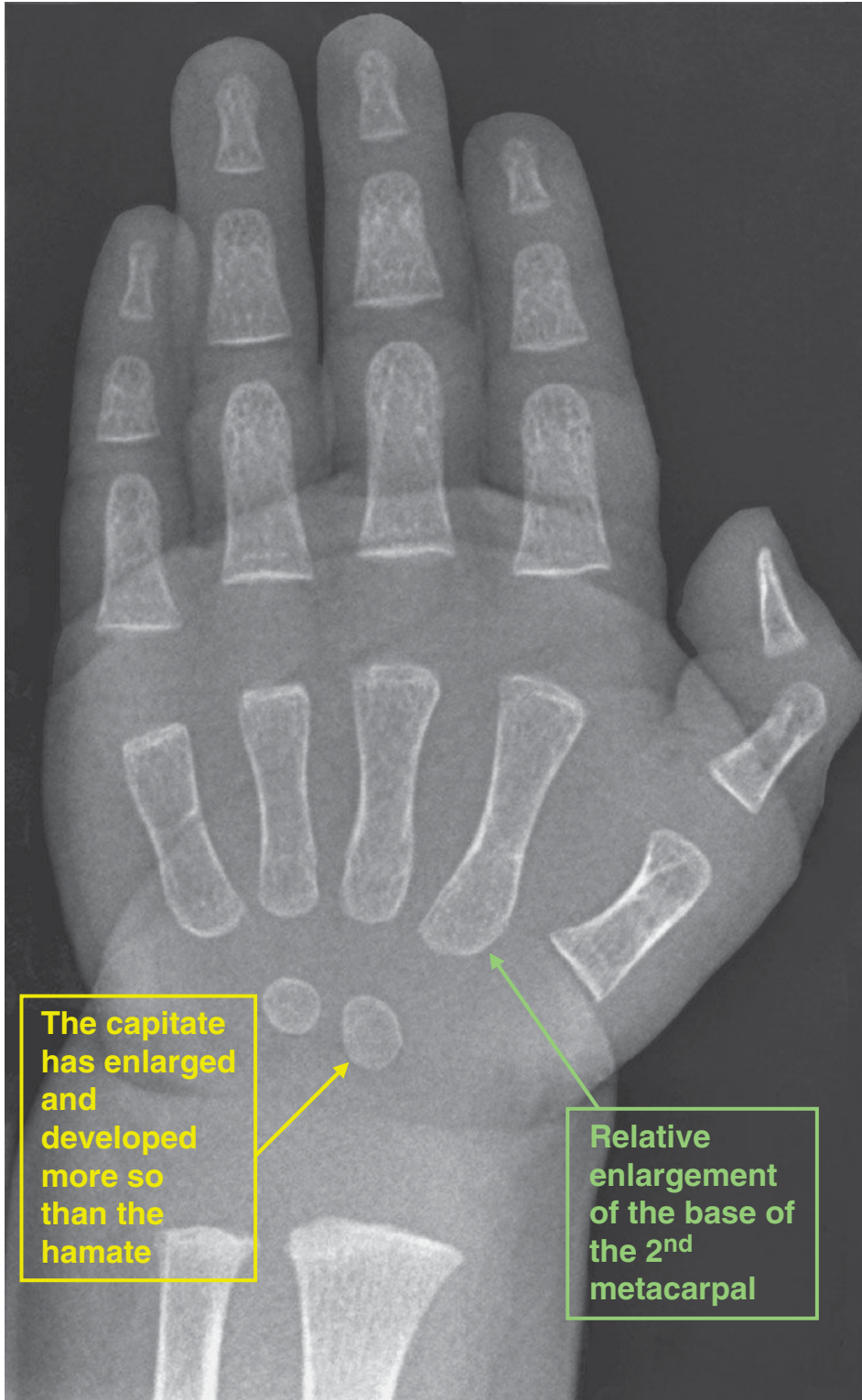
Female

Skeletal Age: 6 Months



Female

Skeletal Age: 9 Months



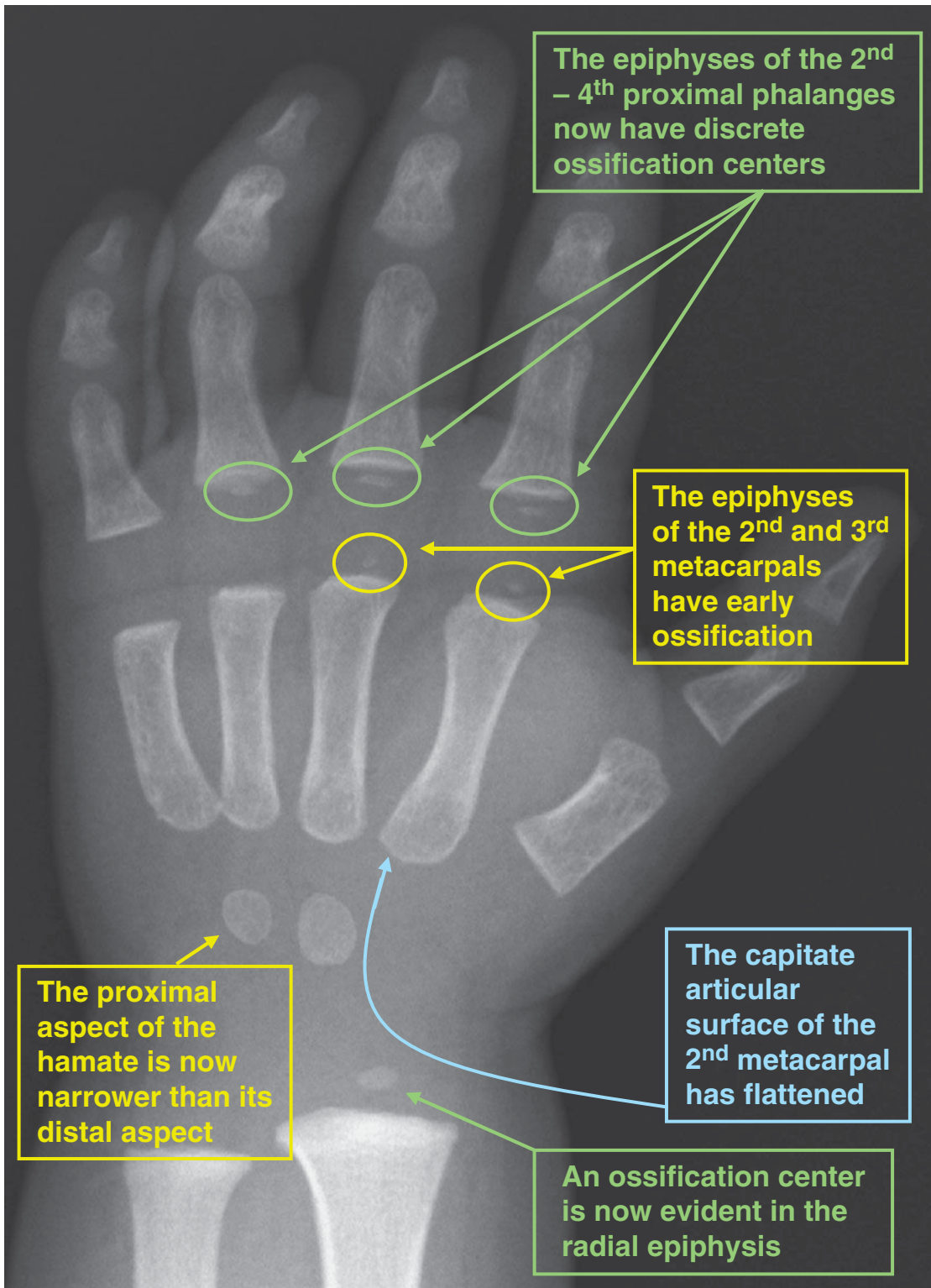
Female

Skeletal Age: 9 Months



Female

Skeletal Age: 1 Year



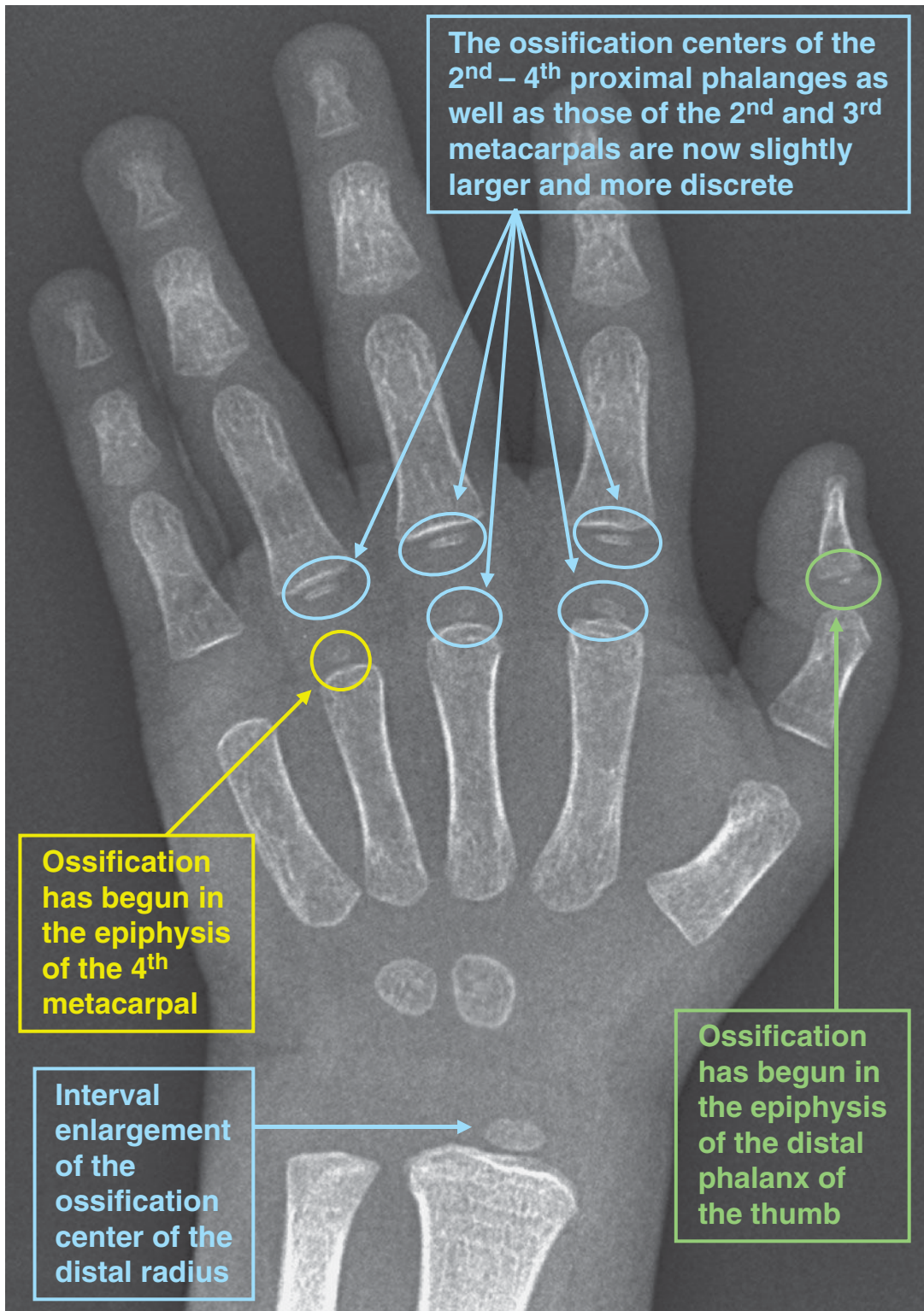
Female

Skeletal Age: 1 Year



Female

Skeletal Age: 1 Year and 3 Months



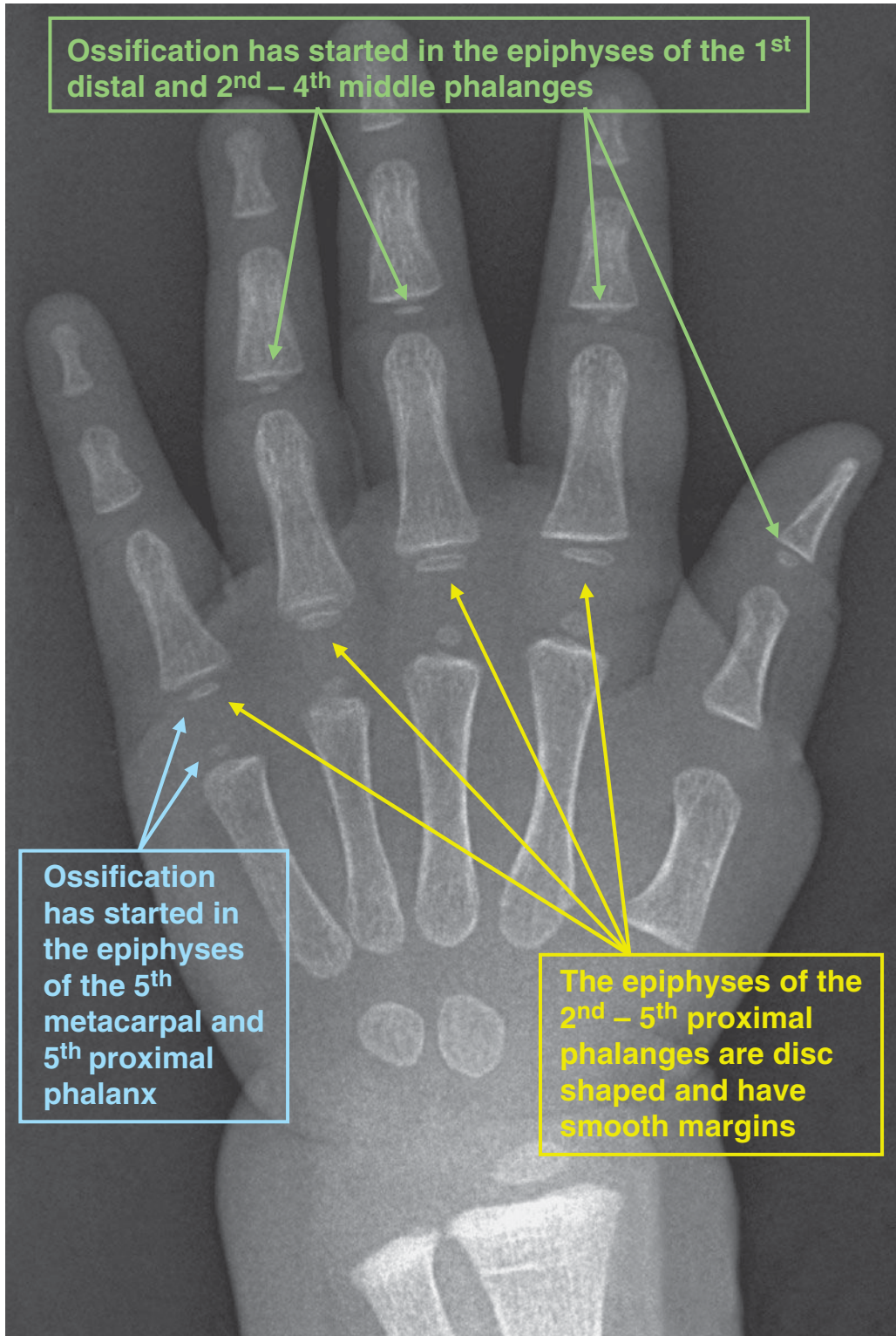
Female

Skeletal Age: 1 Year and 3 Months



Female

Skeletal Age: 1 Year and 6 Months



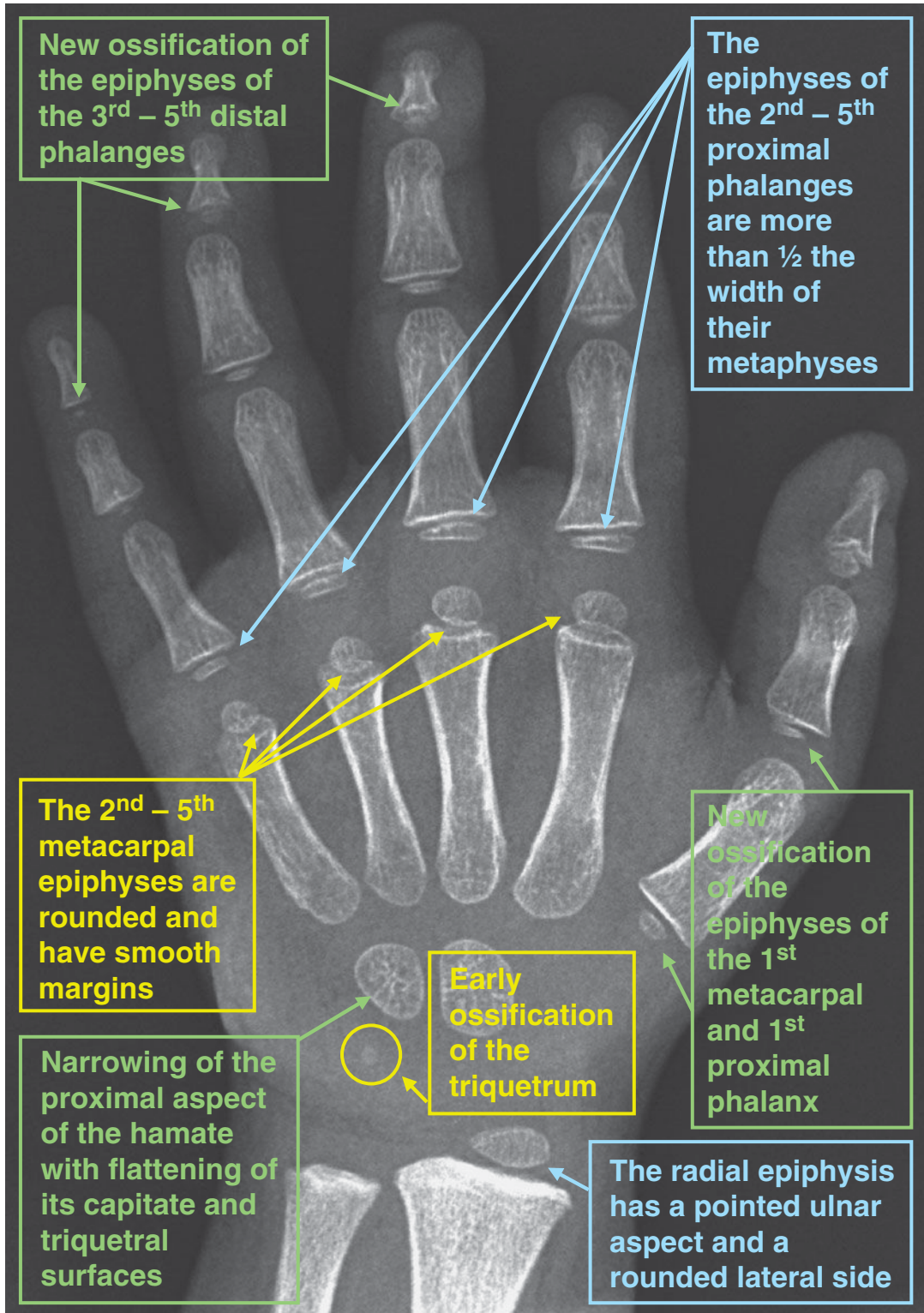
Female

Skeletal Age: 1 Year and 6 Months



Female

Skeletal Age: 2 Years



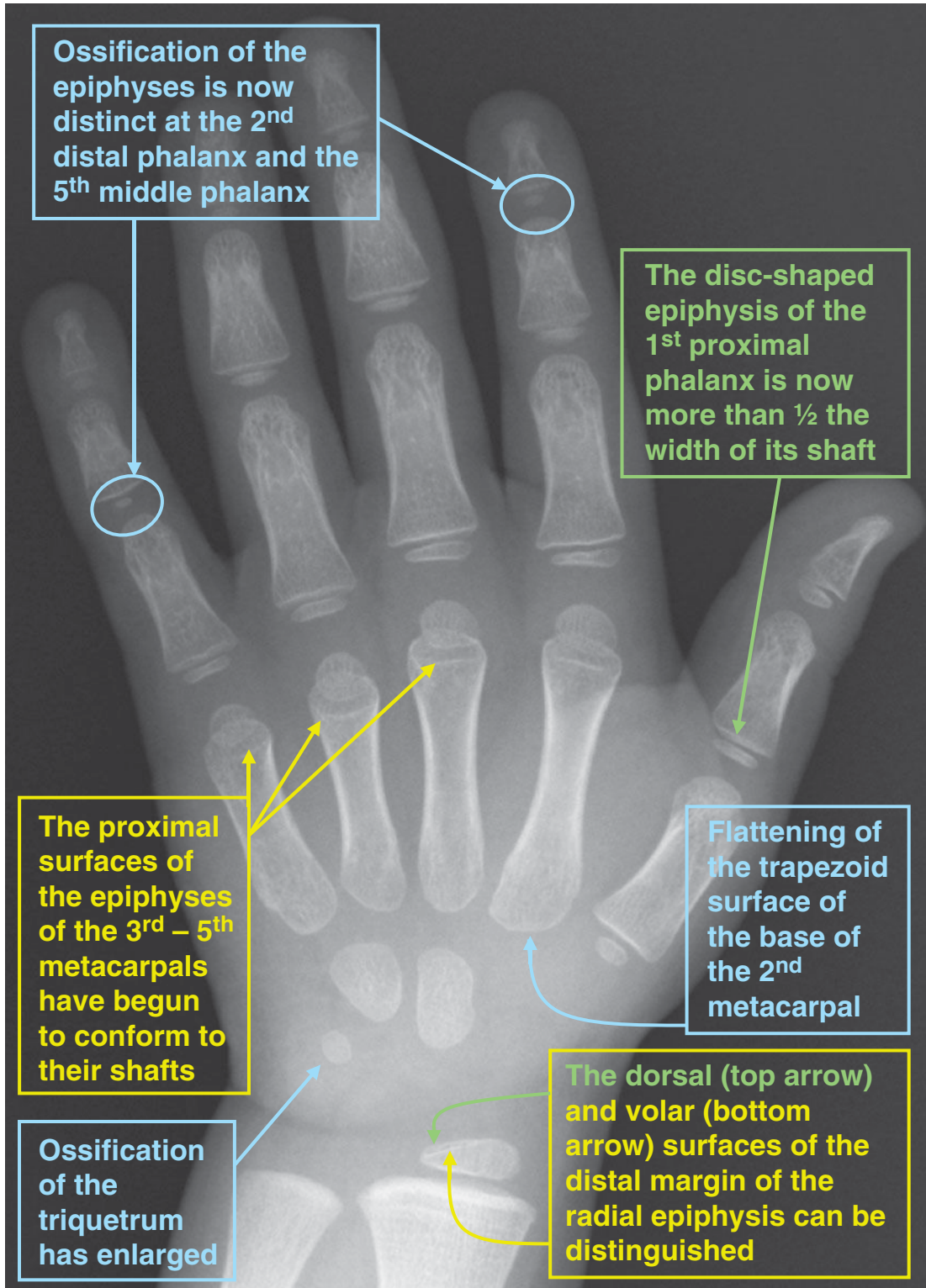
Female

Skeletal Age: 2 Years



Female

Skeletal Age: 2 Years and 6 Months



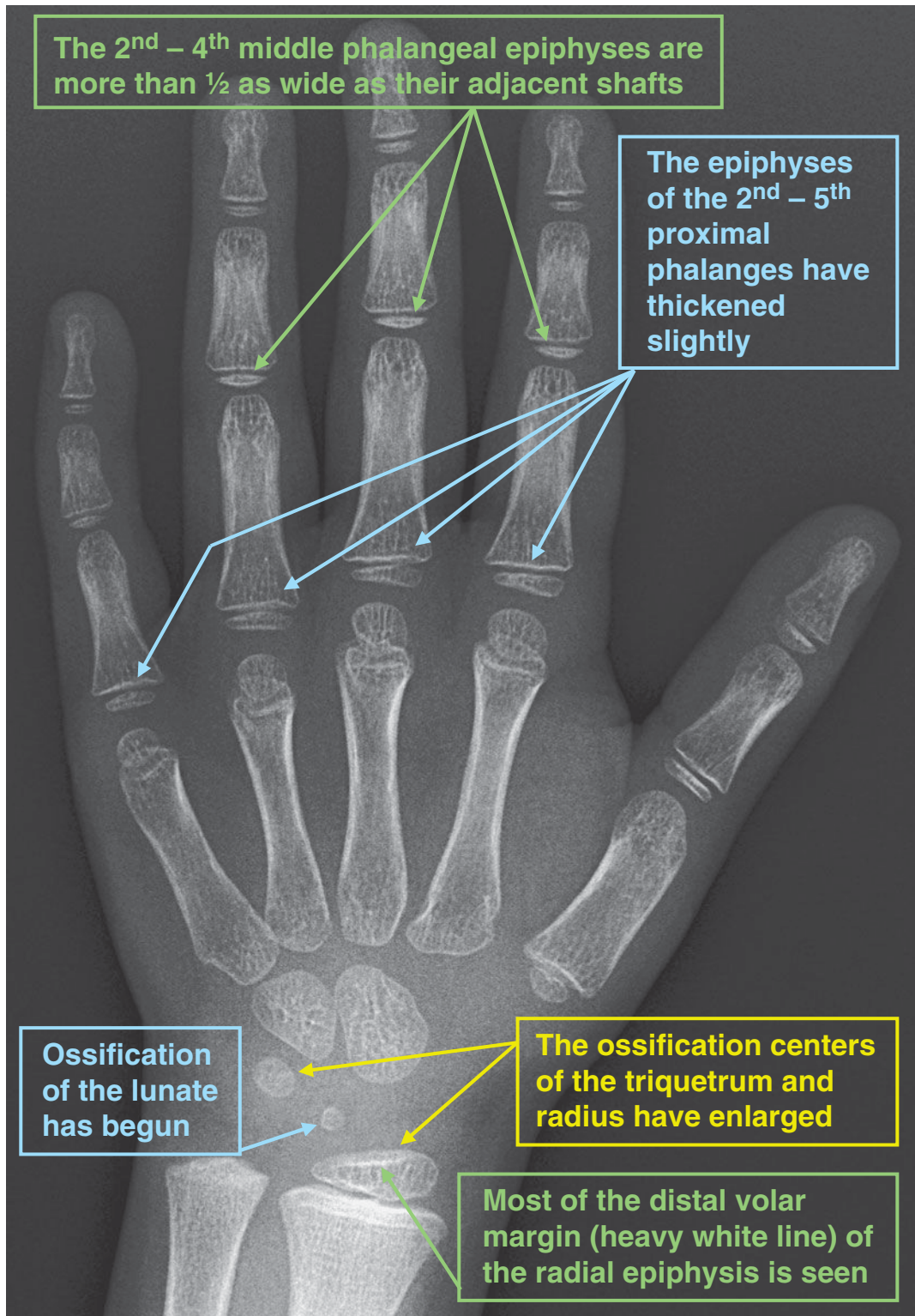
Female

Skeletal Age: 2 Years and 6 Months



Female

Skeletal Age: 3 Years



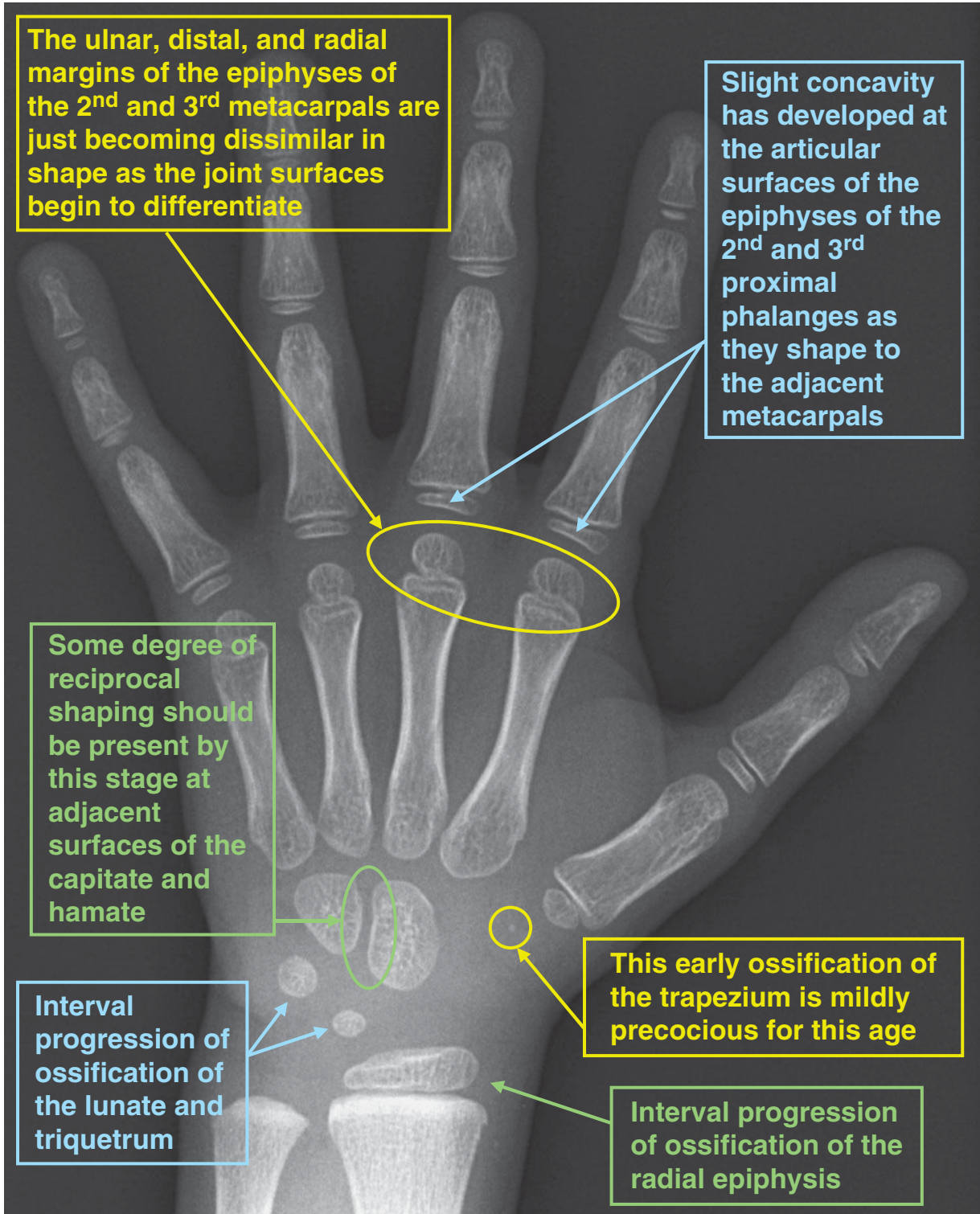
Female

Skeletal Age: 3 Years



Female

Skeletal Age: 3 Years and 6 Months



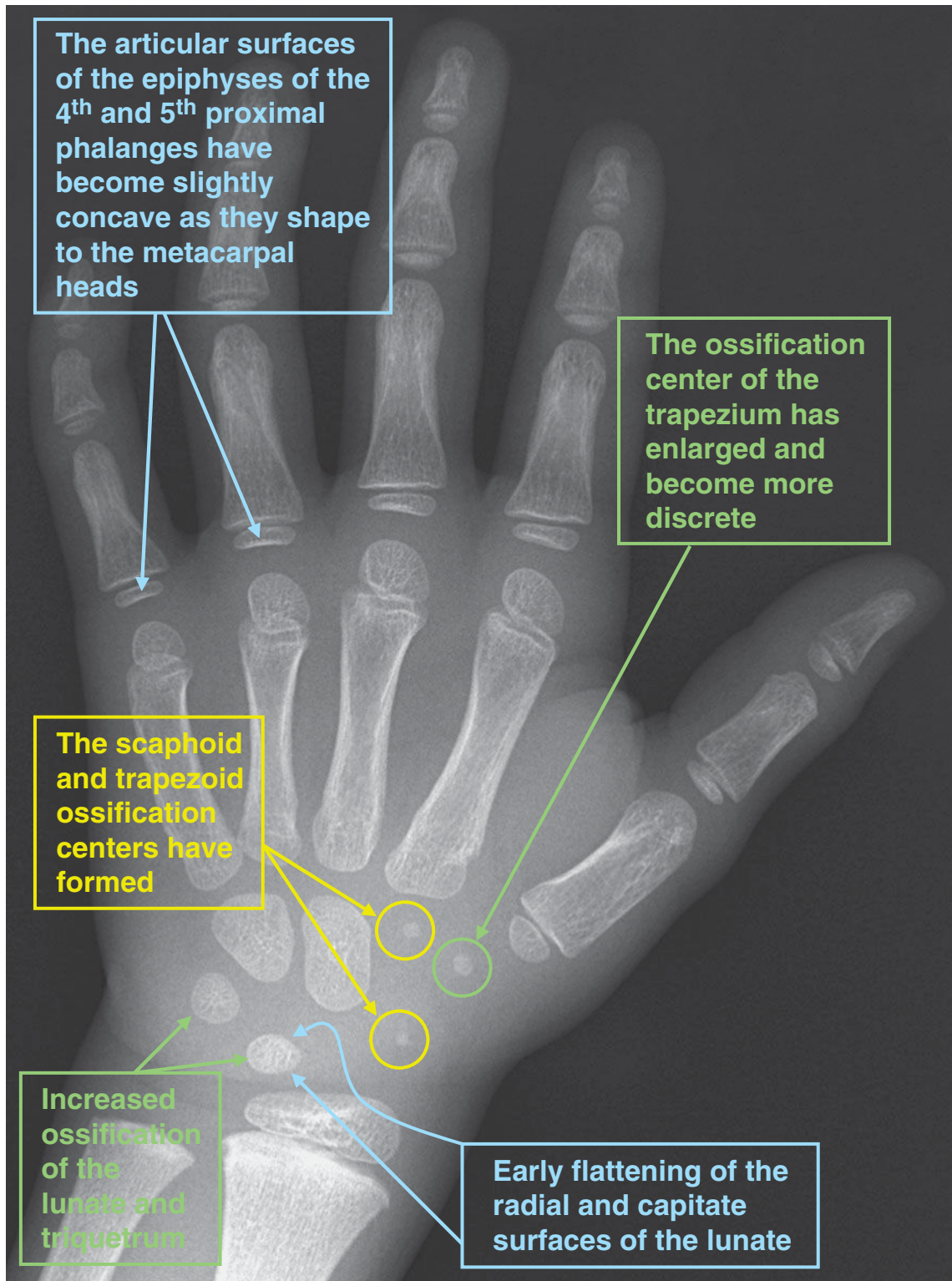
Female

Skeletal Age: 3 Years and 6 Months



Female

Skeletal Age: 4 Years and 2 Months



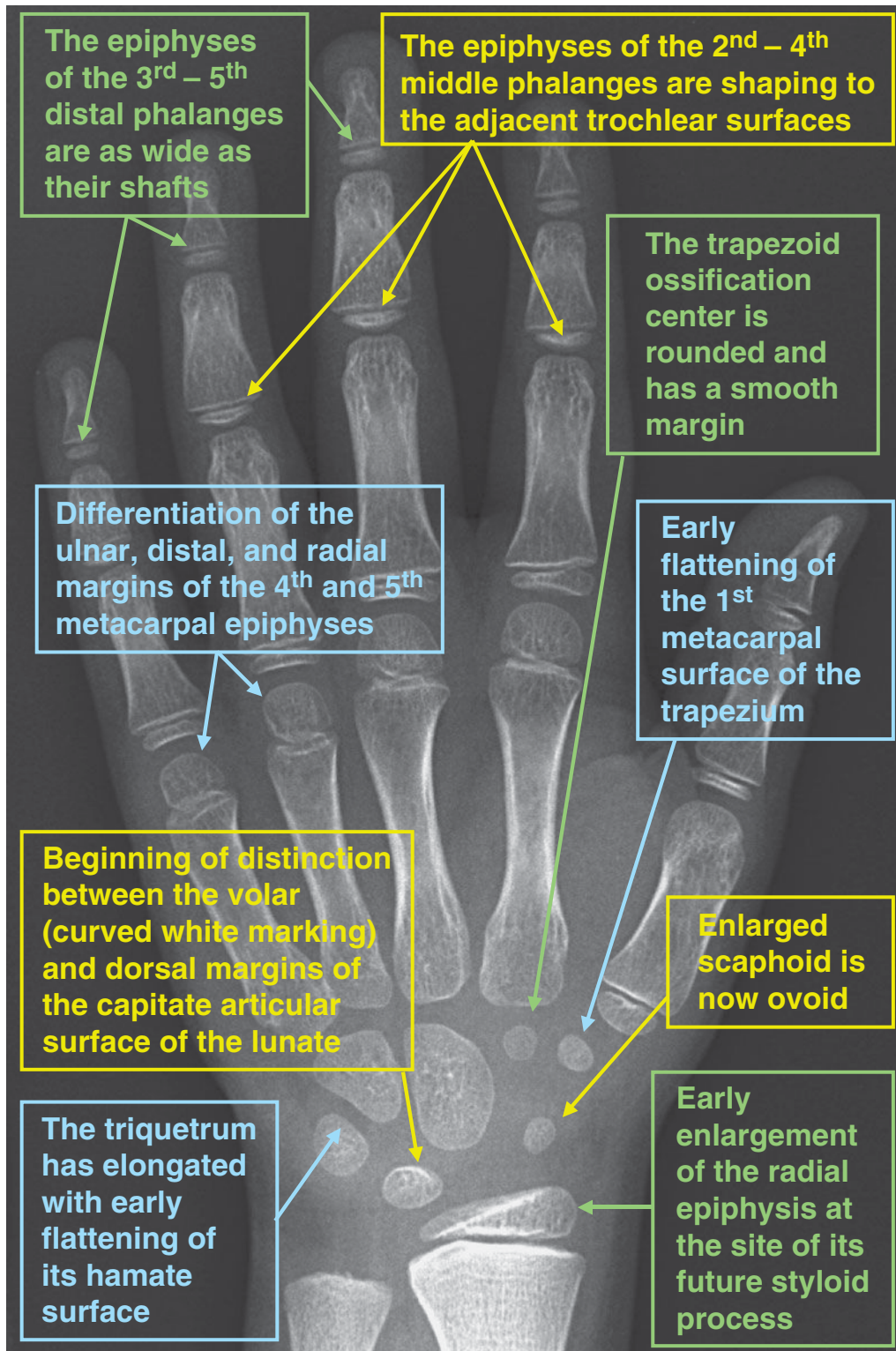
Female

Skeletal Age: 4 Years and 2 Months



Female

Skeletal Age: 5 Years



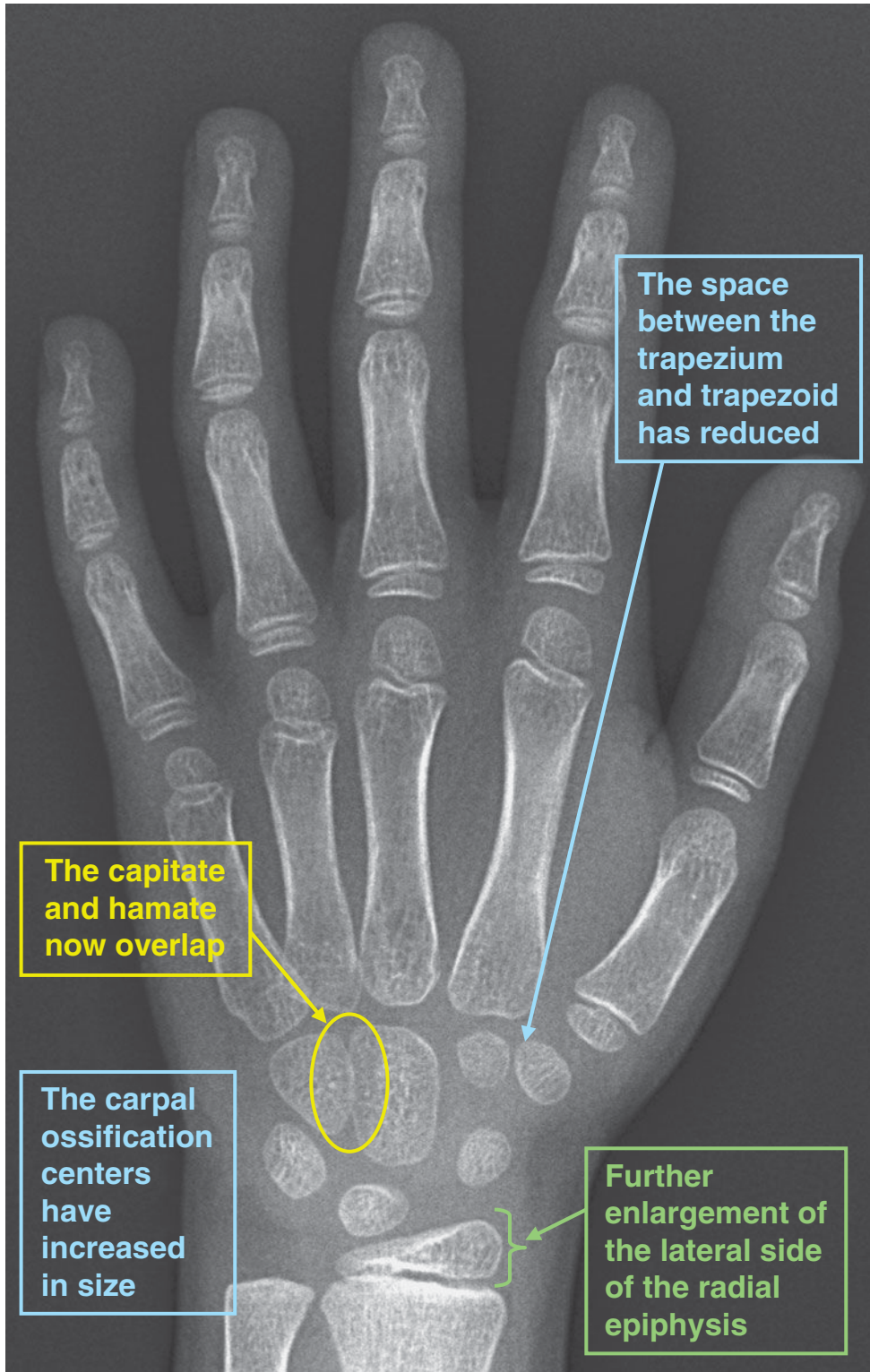
Female

Skeletal Age: 5 Years



Female

Skeletal Age: 5 Years and 9 Months



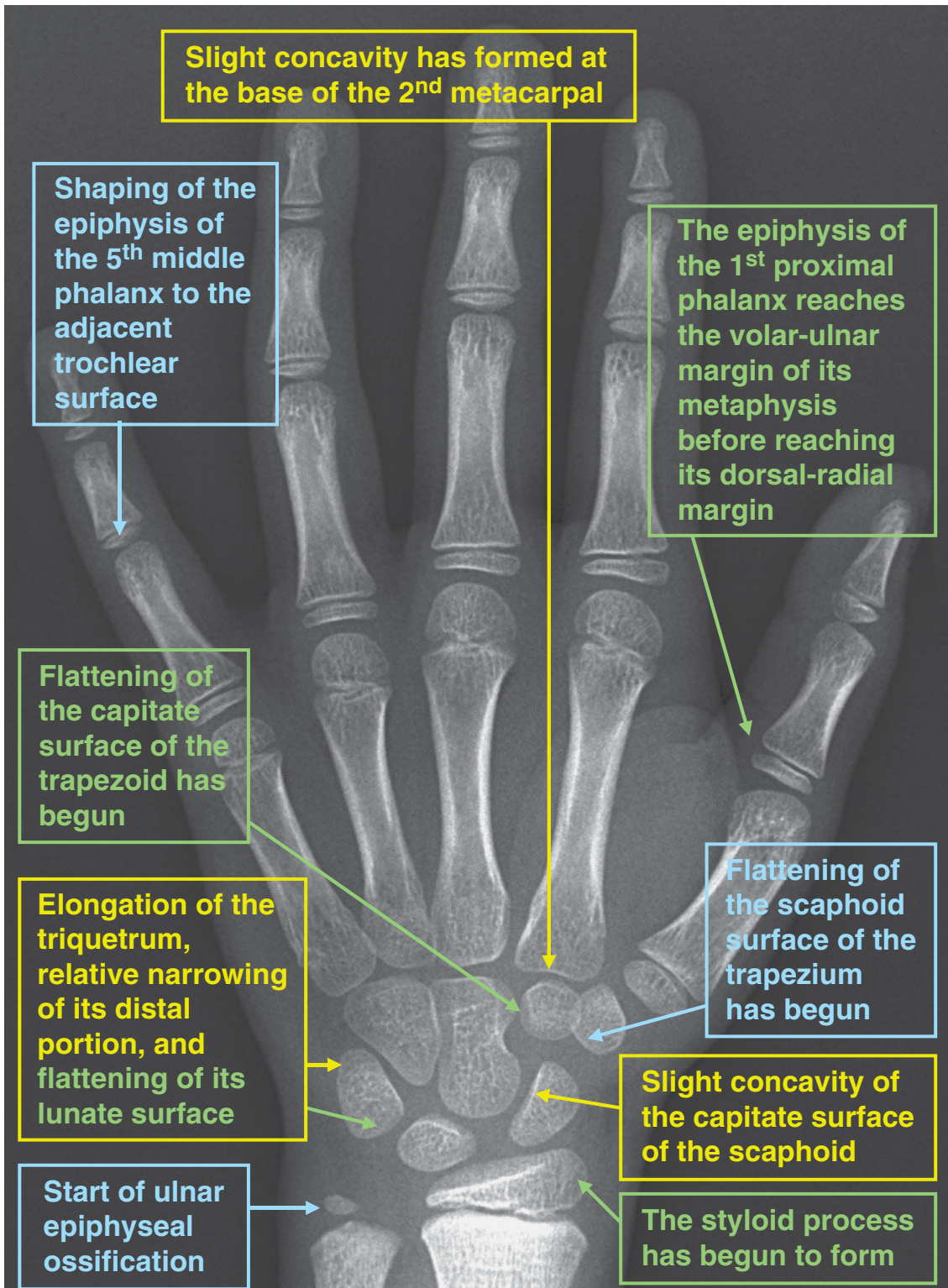
Female

Skeletal Age: 5 Years and 9 Months



Female

Skeletal Age: 6 Years and 10 Months



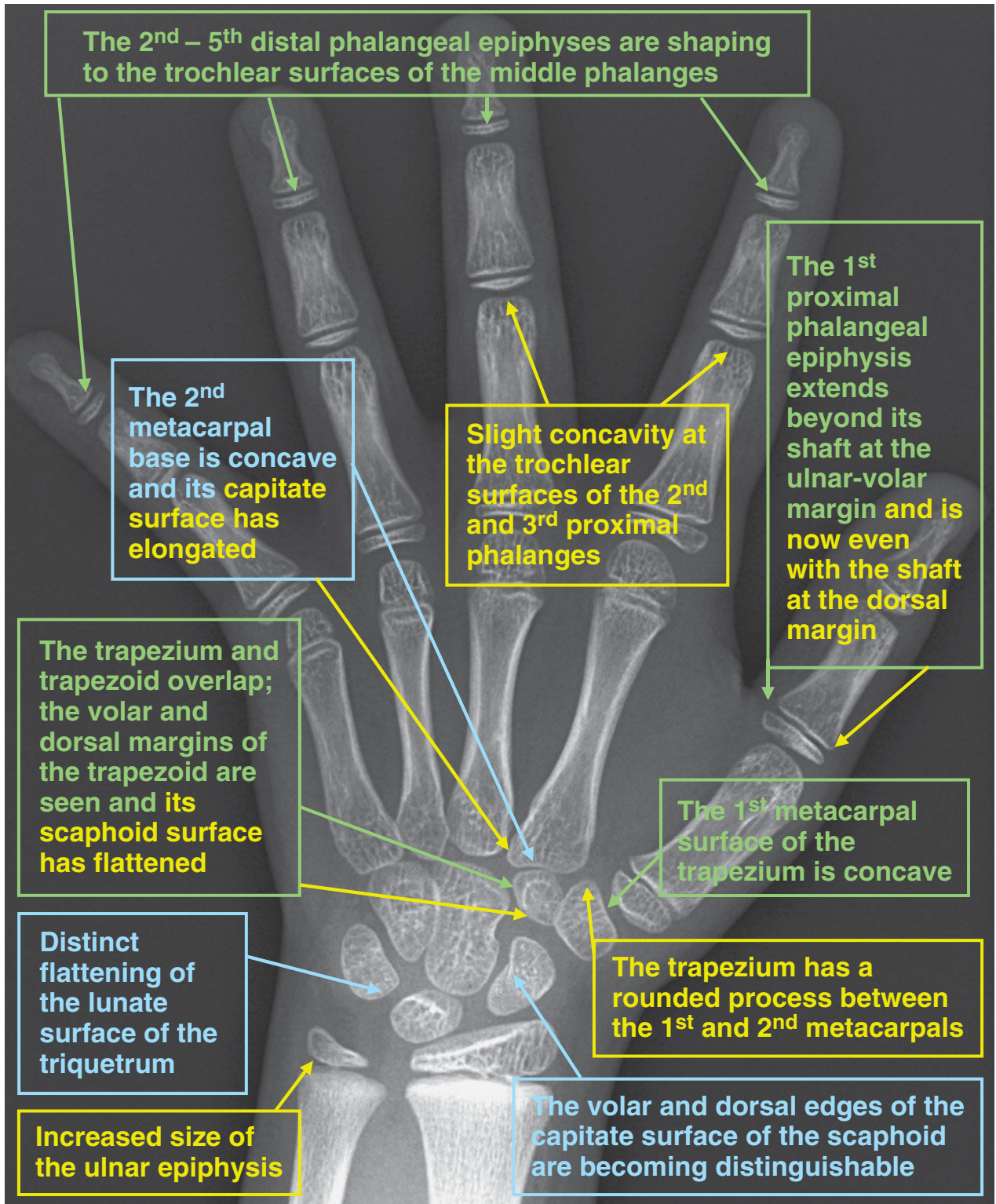
Female

Skeletal Age: 6 Years and 10 Months



Female

Skeletal Age: 7 Years and 10 Months



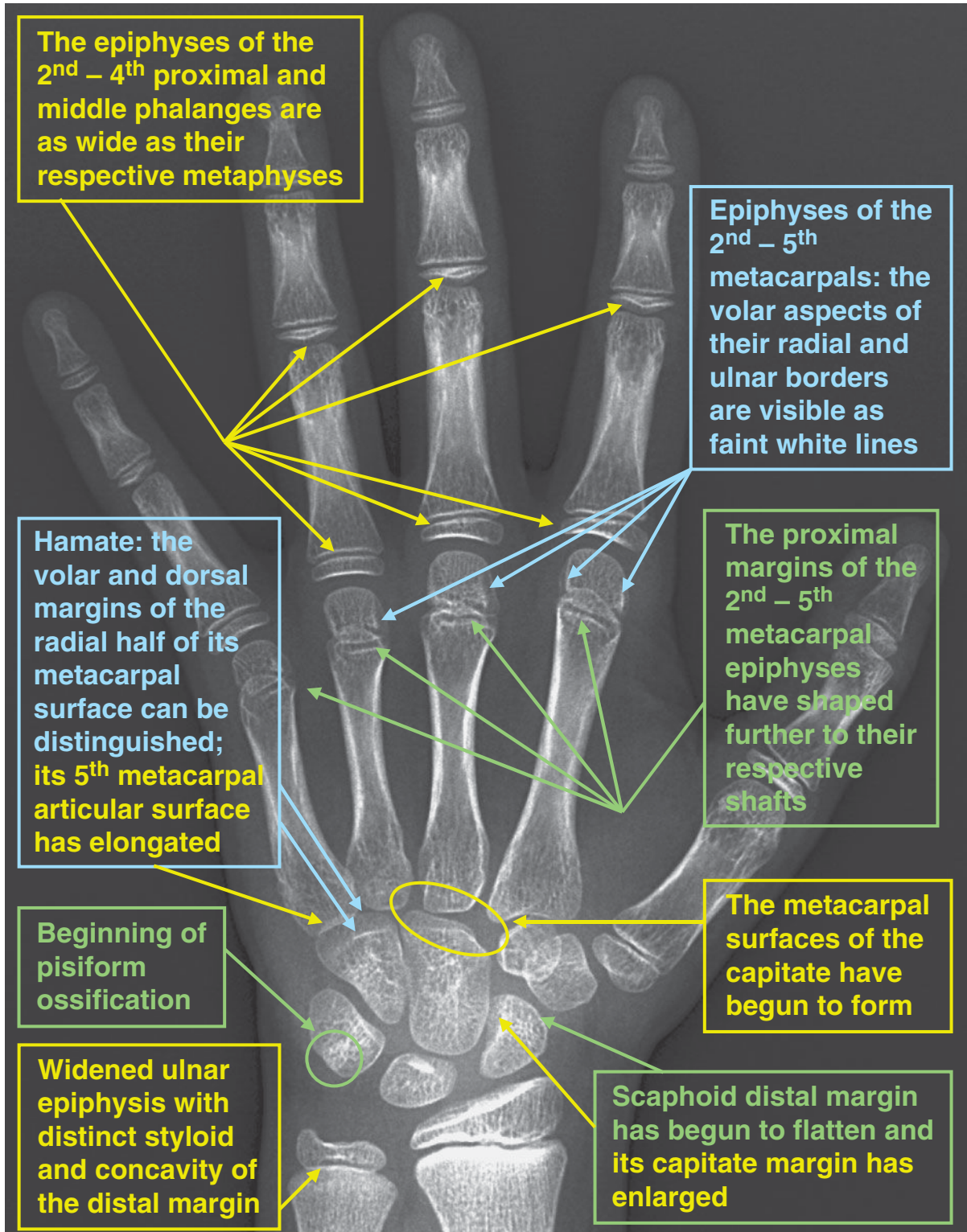
Female

Skeletal Age: 7 Years and 10 Months



Female

Skeletal Age: 8 Years and 10 Months



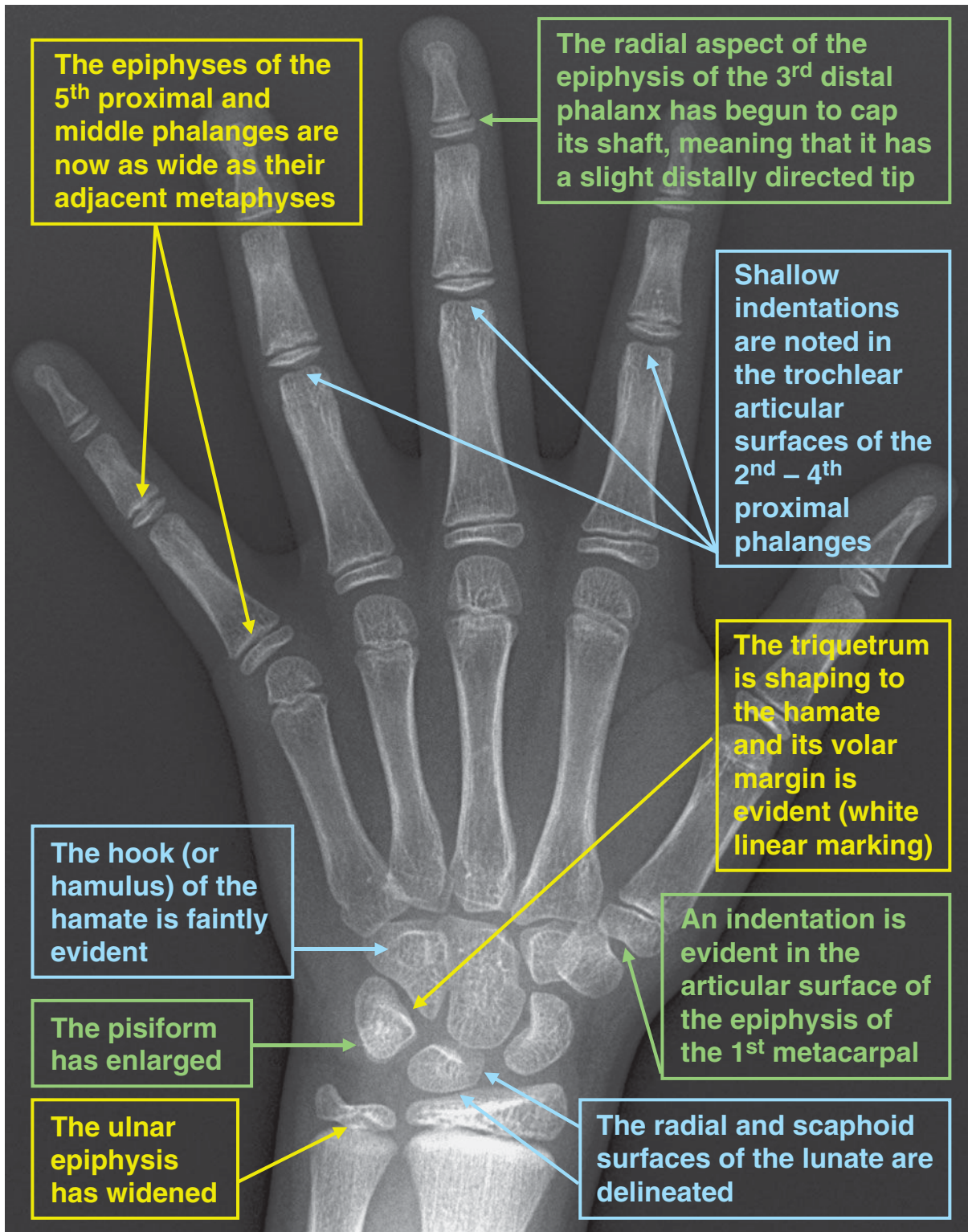
Female

Skeletal Age: 8 Years and 10 Months



Female

Skeletal Age: 10 Years



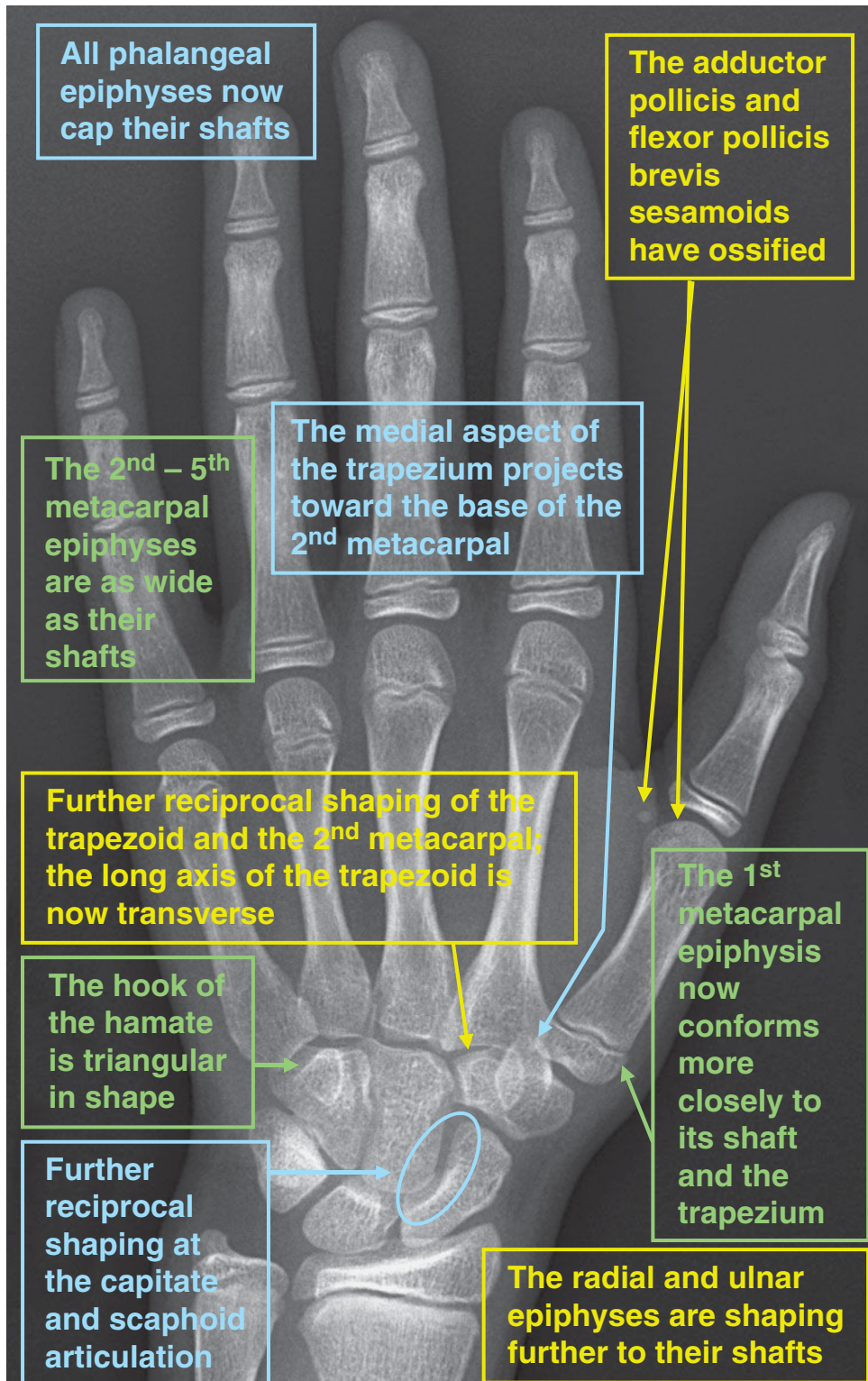
Female

Skeletal Age: 10 Years



Female

Skeletal Age: 11 Years



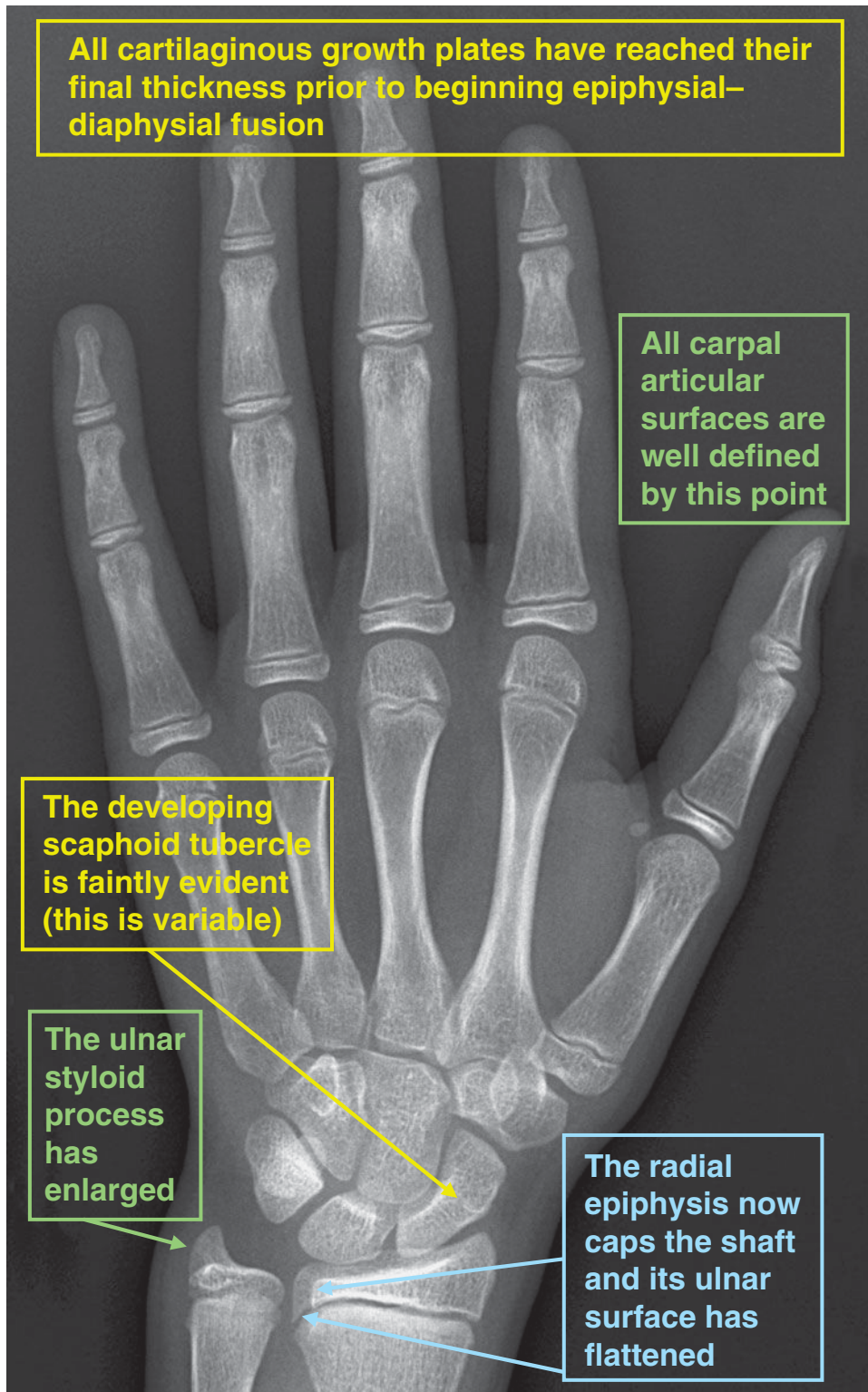
Female

Skeletal Age: 11 Years



Female

Skeletal Age: 12 Years



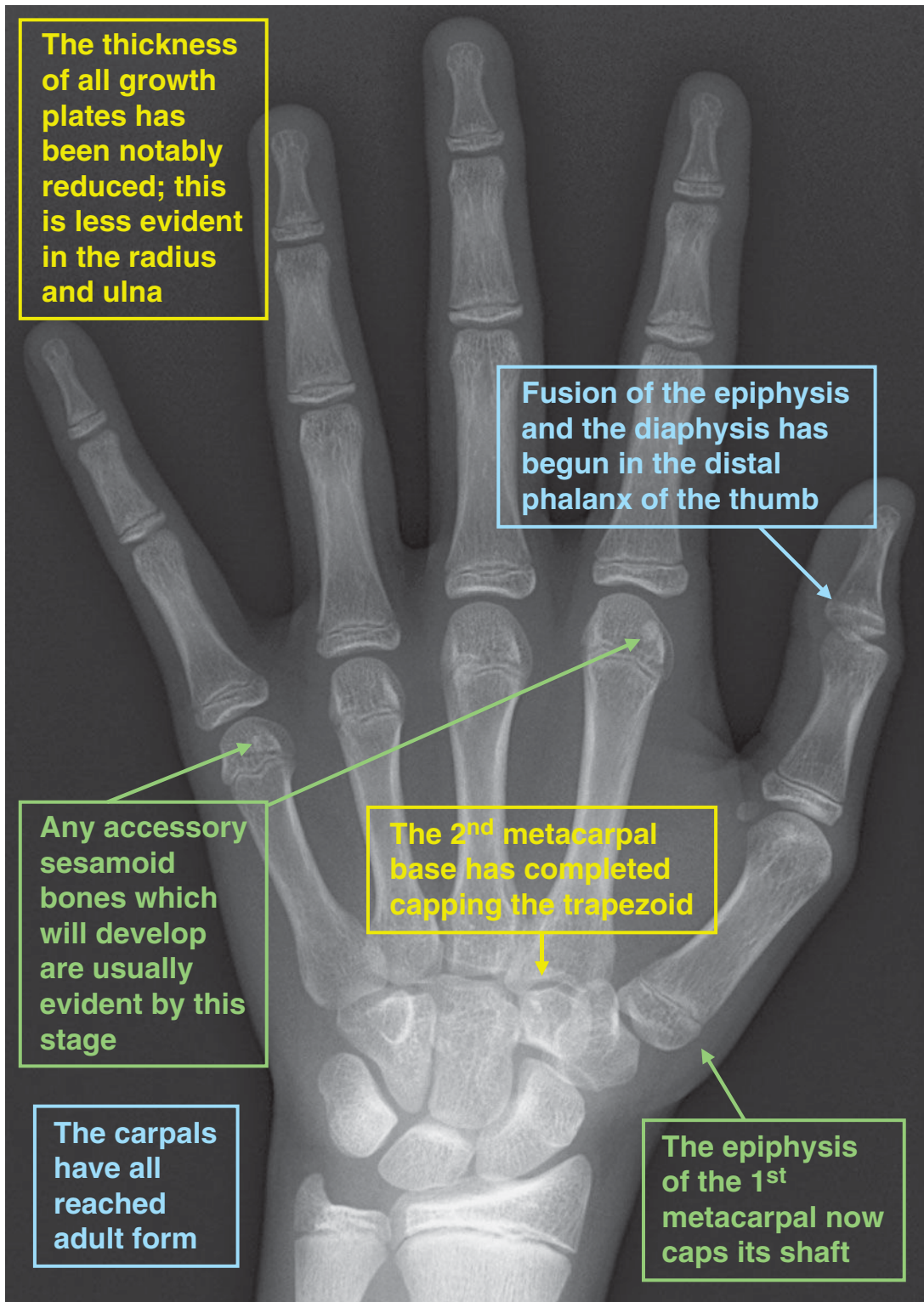
Female

Skeletal Age: 12 Years



Female

Skeletal Age: 13 Years



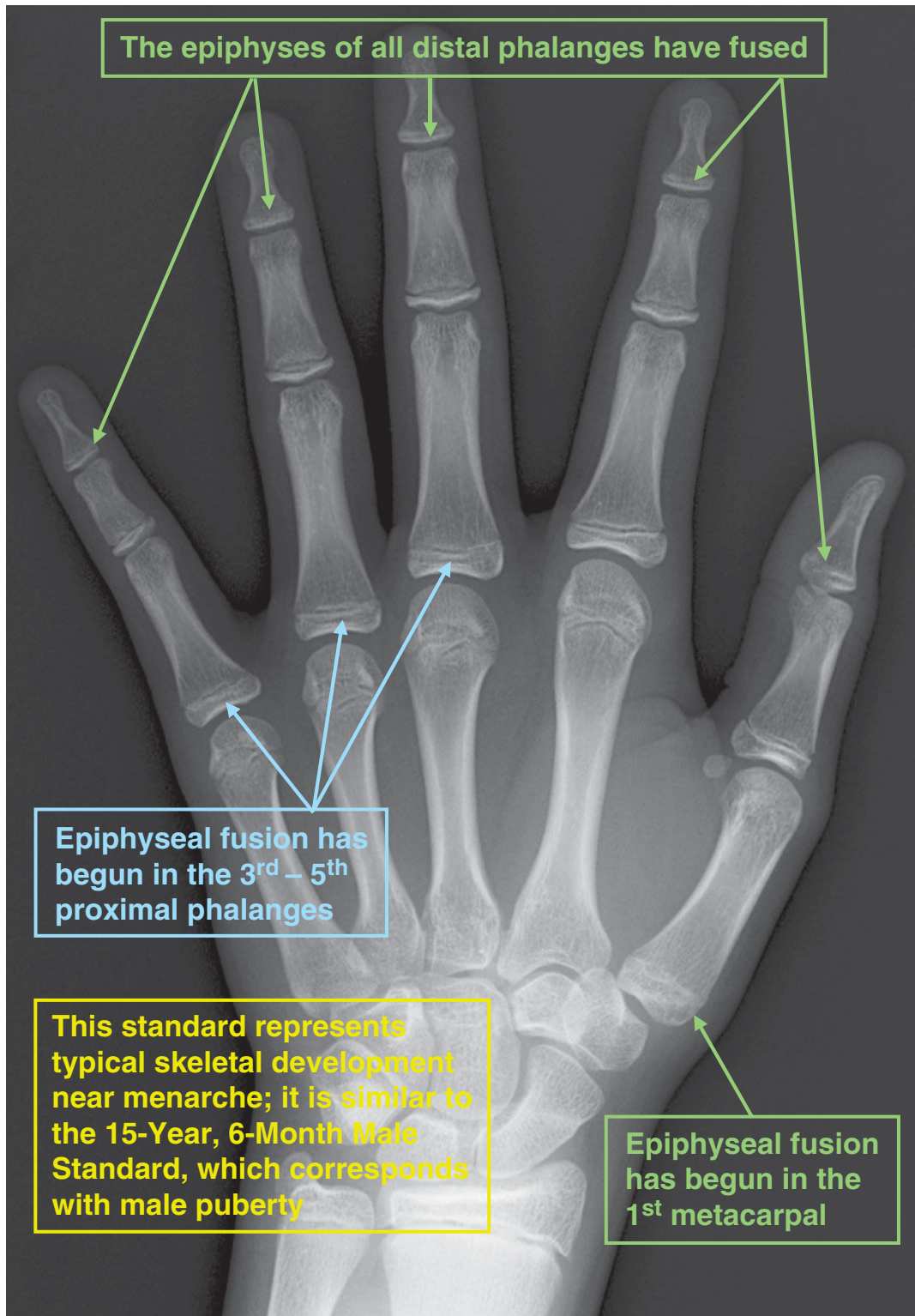
Female

Skeletal Age: 13 Years



Female

Skeletal Age: 13 Years and 6 Months



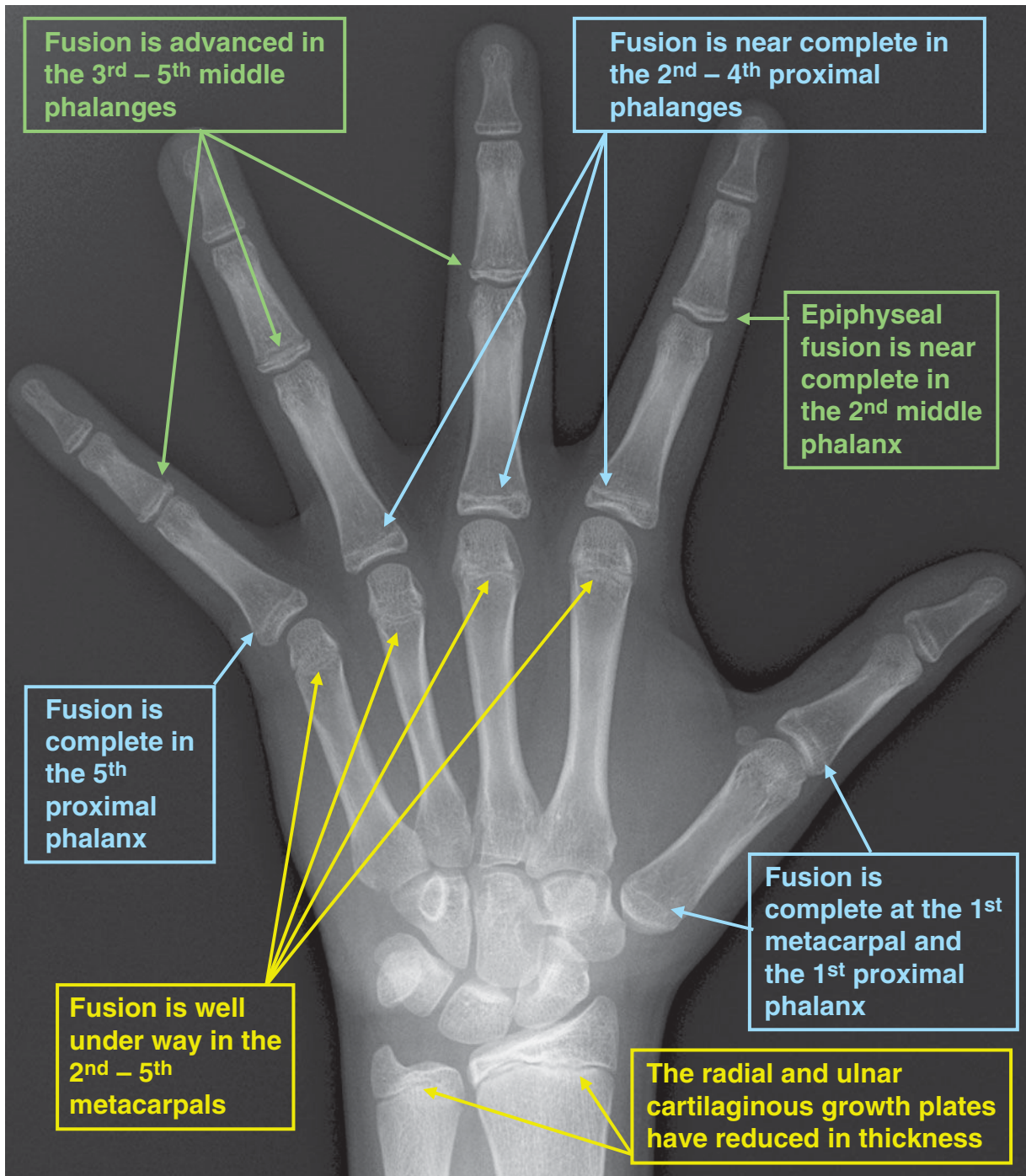
Female

Skeletal Age: 13 Years and 6 Months



Female

Skeletal Age: 14 Years



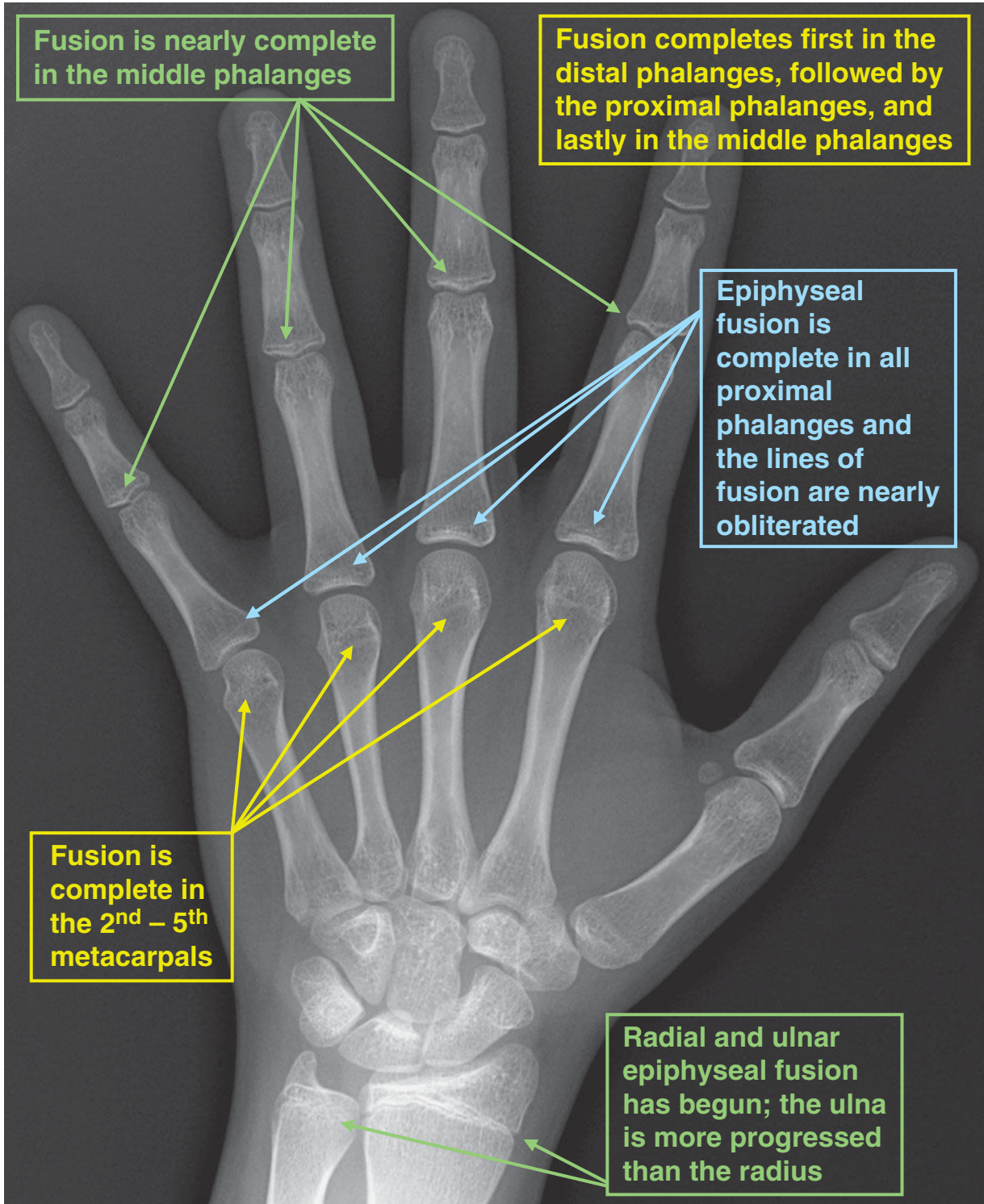
Female

Skeletal Age: 14 Years



Female

Skeletal Age: 15 Years



Female

Skeletal Age: 15 Years



Female

Skeletal Age: 16 Years



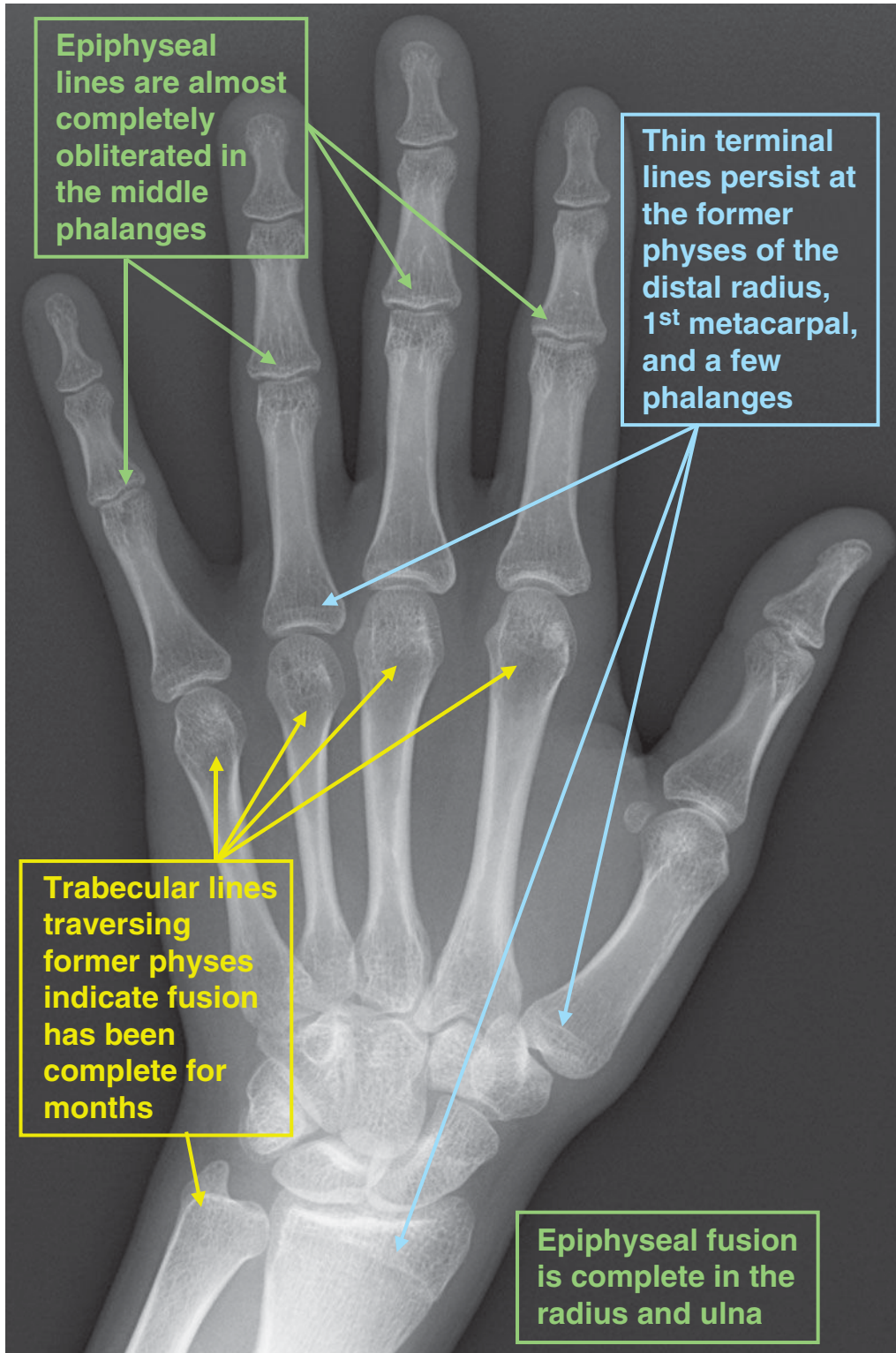
Female

Skeletal Age: 16 Years



Female

Skeletal Age: 17 Years



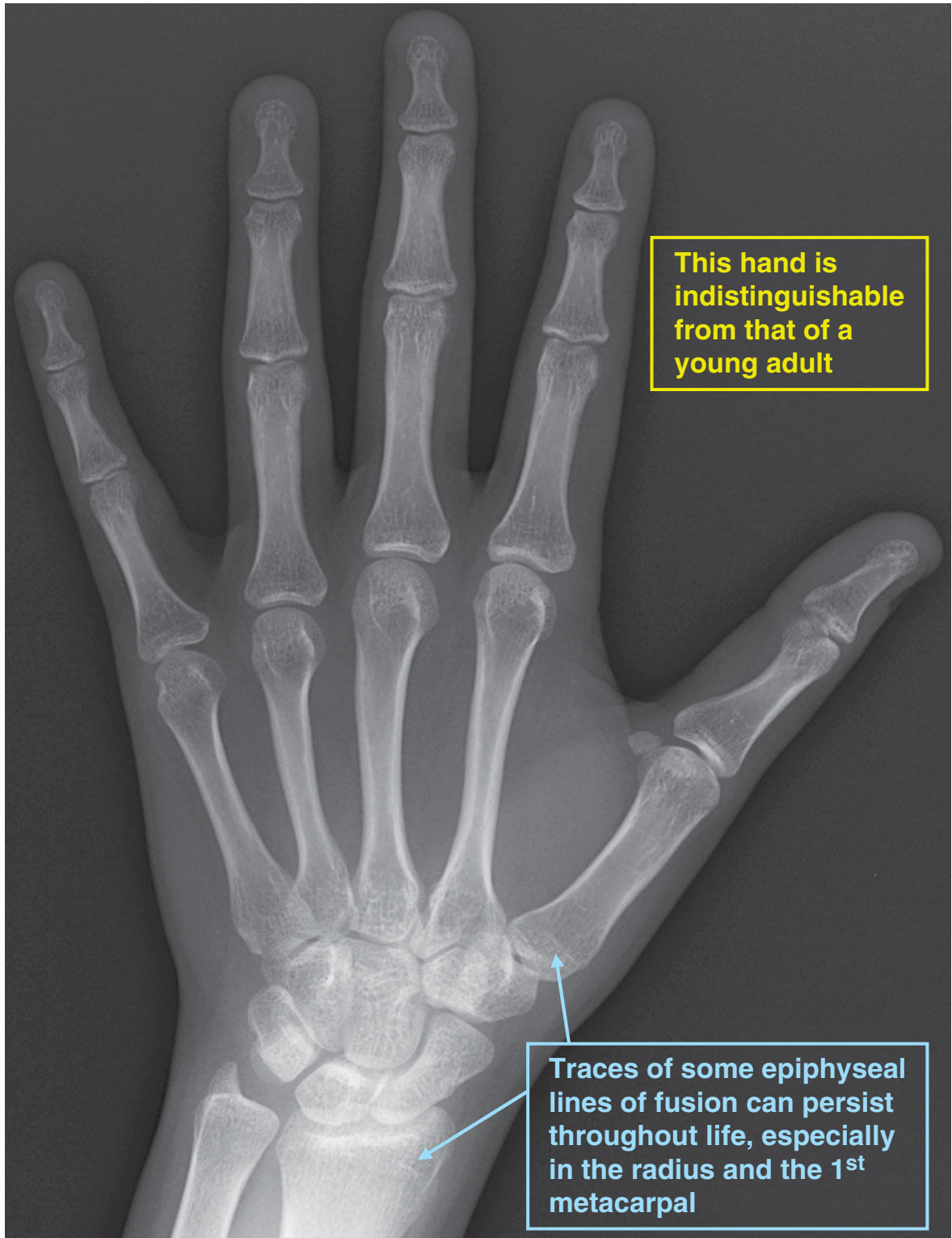
Female

Skeletal Age: 17 Years



Female

Skeletal Age: 18 Years



Female

Skeletal Age: 18 Years

