3. The thermographic examination of sacroiliac joints

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SUMMARY. **Using the AGA 680 Thermovision camera and the isotherm system the temperature in 100 healthy persons and 22 ankylosing spondylitis patients was measured in the following regions: 1) the lower part of the lumbar spine, 2) the iliac crest, 3) the upper part of the sacroiliac joints, 4) the lower part of the sacroiliac joints and 5) the base of the caudal bone. It has been shown that there is a symmetric and characteristic temperature profile of the sacroiliac region, although there may be large differences in temperature in the individual cases. In AS. patients the temperature profile in the lumbosacral region had a different and often asymmetric shape, but no statistically significant differences in the temperature of the lumbosacral region among A.S. and healthy group were observed.**

Key words: thermography; ankilosing spondilitis; sacroiliac joints.

Radiological diagnosis of inflammatory changes of sacroiliac joints may cause some difficulties, especially in early stages of the disease. In recent years more attention has been given to new diagnostic method for evaluating these joints.

From the theoretical point of view, thermography, which shows changes in regional heat and quantitatively defines its intensity, should give evidence of heat in the area of inflamed sacroiliac joints in cases of their inflammatory changes.

The possibility of using thermography for evaluating the dynamics of inflammatory changes in sacroiliac joints has been reported by Cosh and Ring[2,3], Sadowska-Wroblewska and co-workers[4] and Agarwal and co-workers [1].

The thermographic examination of sacroiliac joints previously reported have not been related to the normal subject.

The purpose of this study is to estimate the temperature of the sacroiliac region in healthy subjects and evaluate the usefulness of thermography in the diagnosis of ankylosing spondylitis.

Methods

Thermographic examination was performed with the AGA 680 Thermovision. Patients were lying uncovered in a prone position in a room at a temperature of 18°C for 10 minutes before and during examination. A temperature reference source was

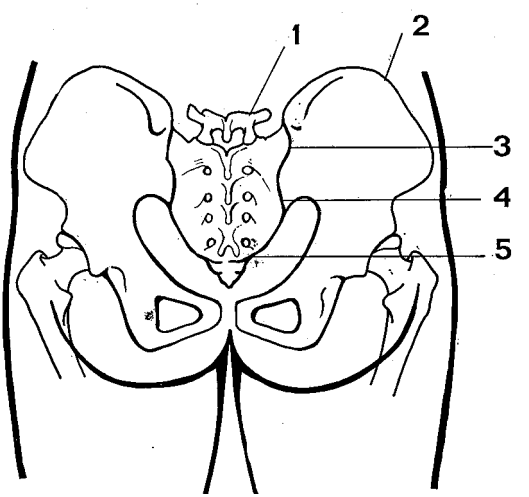


Fig. 1.

positioned close to the area examined for calibration purposes.

Using the isotherm system, thermograms were recorded, and the temperature of the following 5 regions measured:

1) The lower part of the lumbar spine; 2) the iliac crest; 3) the upper part of sacroiliac joint; 4) the lower part of sacroiliac joint; 5) the base of the caudal bone. Points No. 2, 3, and 4 were measured separately on the right and left side (Fig. 1). For some patients photographic recording with coloured filters was employed.

Material

Thermographic examinations were performed on 100 healthy persons (50 male and 50 female) from the age of 20 to 55 years (27 years on average). 22 ankylosing spondylitis patients (12 male and 10 female) in the age group 21-52 years (30 years on average) were examined (Table I). The diagnosis was estimated according to the New York criteria.

Tab. I. **Thermographic examinations.**

	Total	*m.*	*Age.*		*Average age*
	n	*n*	*n*	*in years*	
Healthy persons	100	50	50	25-55	27
A.S. patients	22	12	10	21-52	30

Results

In the normal subjects the temperature of the sacroiliac region was the same on the right and left side.

In men the temperature of the whole lumbosacral region varied between 30°C and 36°C and in women between 29°C and 36°C (Table II).

In both sexes the highest temperature was noticed in the region of the lumbar spine then in the upper part of the sacroiliac joints and in the base of the caudal bone. The higher temperature in the lumbar spine and in the base of the caudal bone may be due to the vertical median hollow formed by the erector spinae muscles and gluteal muscles.

There are great differences in the temperature among the individual cases but the shape of the curve obtained from the temperature of the 5 above mentioned points was consistant in all the normal subjects (Fig. 2). In women the temperature of the lumbosacral region is slightly (but not statistically significantly) lower than in men. It may be due to the thicker fat tissue layer which is the bad heat conductor in that region found in women.

In males with ankylosing spondylitis the temperature of the whole lumbosacral region ranged from 30°C to 36°C and in female patients from 30°C to 35°C (Table III).

In some patients the asymmetry of temperature above the right and left sacroiliac joint was observed. The differences between both sides in individual cases ranged from *0.5°C* to *2.O°C*.

The lowest temperature in ankylosing spondylitis patients above the sacroiliac

Tab. II. **Thermographic examination of 100 healthy persons.**

Region	*Men*			*Women*		
	range from-to °C	*average °C*	*S.D.*	*range from-to °C*	*average °C*	*S.D.*
1. Lumbar spine	32,5-36	35,04	0,73	32-36	33,98	0,57
2. Iliac crest	30-35	33,51	1,39	29-34	32,O8	1,49
3. Sacroiliac joint upper part	32-36	34,08	0,9	31-35	33,05	1,23
4. Sacroiliac joint lower part	30-35	32,55	1,4	29-34	31,26	1,34
5. Caudal bone	31-36	33,97	0,99	29-35	32,87	1,65

Tab. III. Thermographic examination of 22 A. S. patients.

Region	Men			Women		
	range from-to °C	average °C	S.D.	range from-to °C	average °C	S.D.
1. Lumber spine	33-36	35,14	1,0	33-35	34,15	0,8
2. Iliac crest	30-33	31,67	1,1	29-33	31-80	1,6
3. Sacroiliac joint upper part	32-36	34,85	1,3	31-34,5	33,10	1,2
4. Sacroiliac joint lower part	31-35	33,04	0,7	30-34	32,02	1,4
5. Caudal bone	32-34,5	33,62	0,7	31-35	33,70	1,1

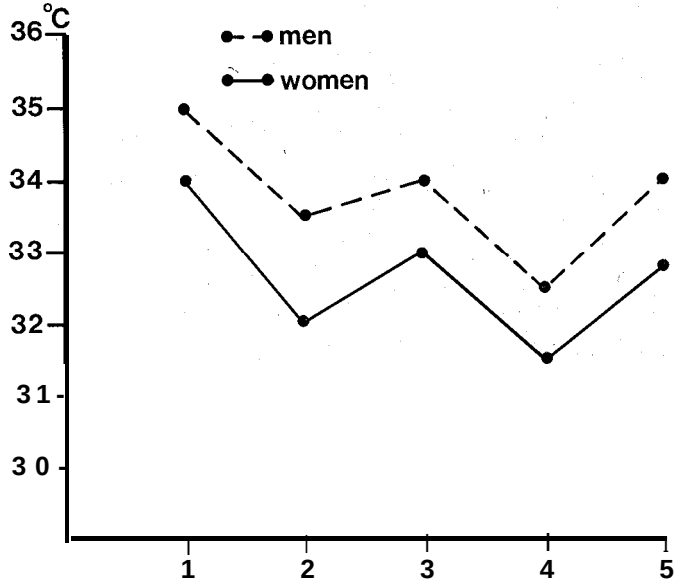


Fig. 2.

Tab. IV. Thermographic evaluation of sacroiliac region.

Region	Men				Women				P
	average temperature healthy °C	A. S. °C	t	p	average temperature healthy °C	A. S. °C	t		
1. Lumbar spine	35,07	35,14	0,15	>o,s	33,98	34,15	0,09	>0,9	
2. Iliac crest	33,51	31,67	0,75	>0,4	32,08	31,80	0,04	>0,9	
3. Sacroiliac joint upper part	34,08	34,85	0,26	>0,7	33,05	33,10	0,49	>0,6	
4. Sacroiliac joint lower part	32,55	33,04	0,20	>0,8	31,26	32,02	0,27	>0,7	
5. Caudal bone	33,97	33,62	0,17	>0,8	32,87	33,70	0,28	>0,7	

joints recorded in some individual cases was 1" C higher than in the normal subjects but this did not prove to be statistically significant (Table IV).

Figure 3 shows the curve obtained from the average temperature of the 5 above mentioned points in ankylosing spondylitis male and female patients. The curves obtained

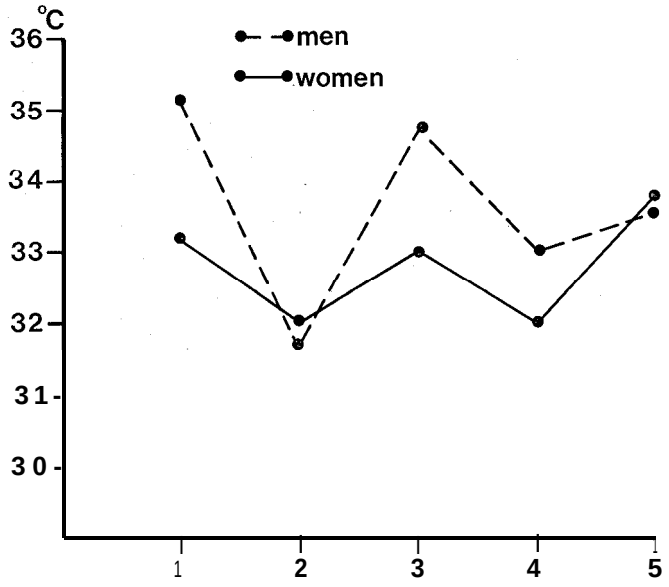


Fig. 3.

from individual ankylosing spondylitis cases took a different form from those of the normal subjects.

Figure 4 is an example of an ankylosing spondylitic male patient. There is the asymmetry between the right and left sacroiliac region and the curve obtained from the temperature of 5 points in the lumbosacral region had a different form from the normal.

Figure 5 shows the normal thermograms

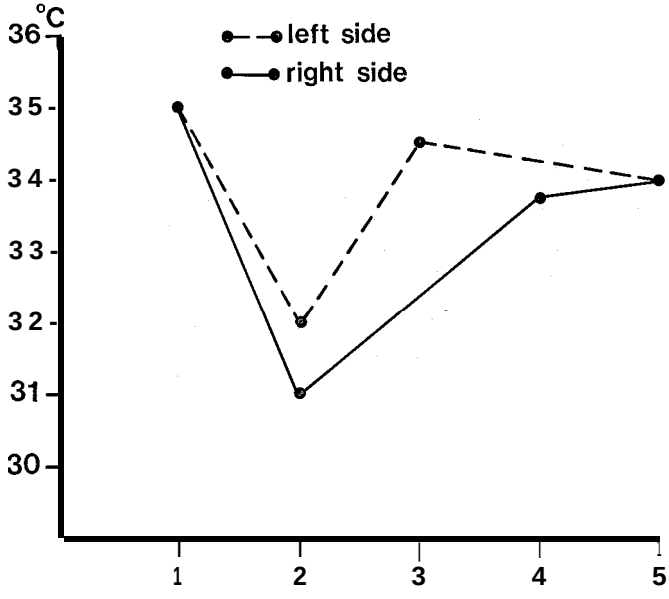


Fig. 4.

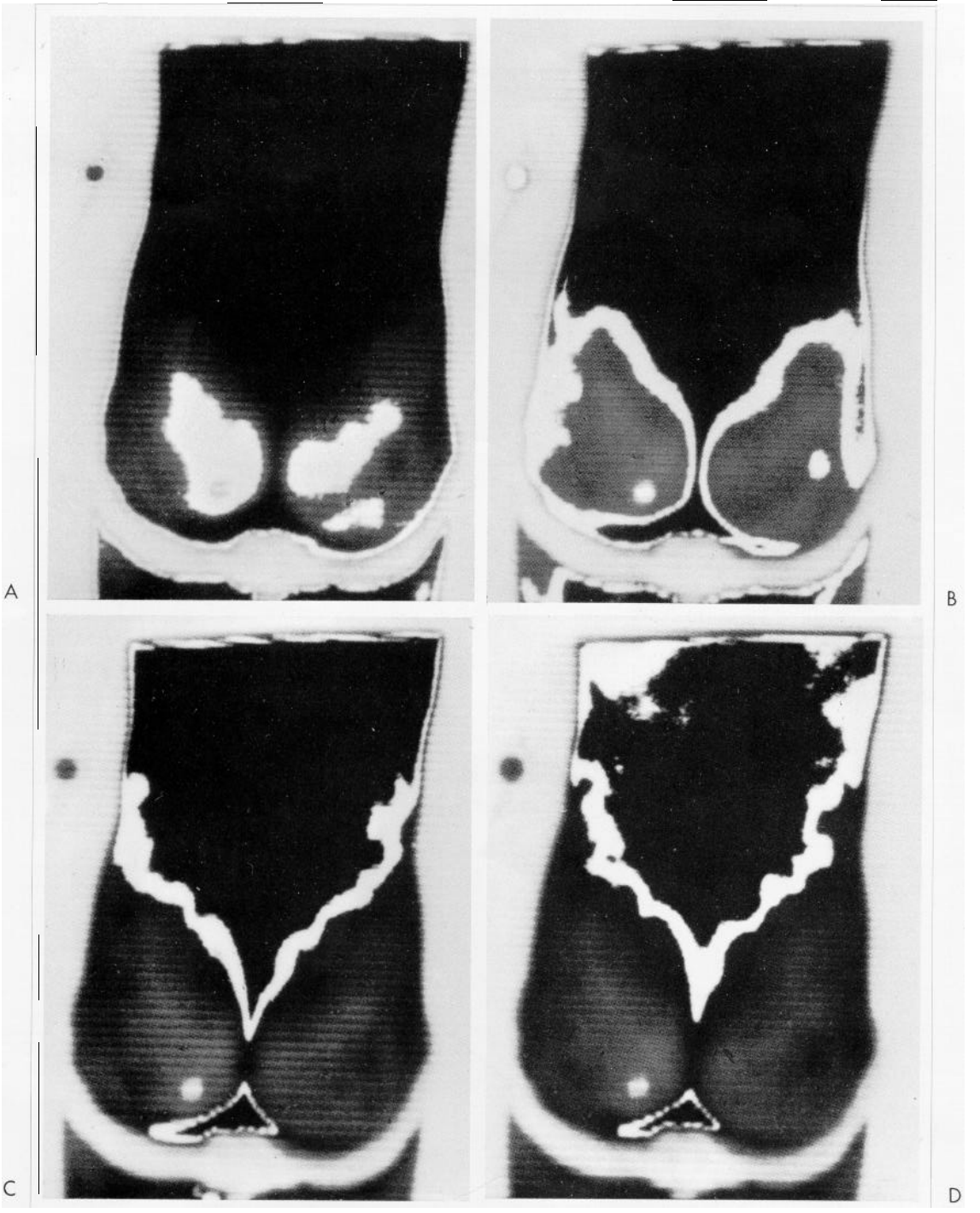
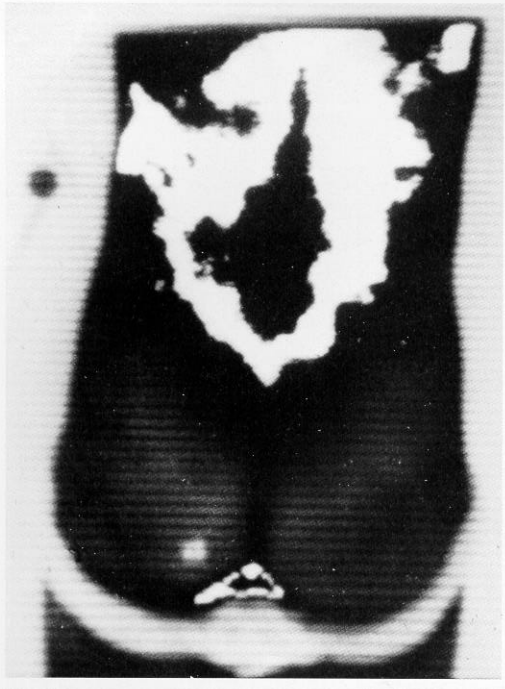


Fig. 5 A-B-C-C.



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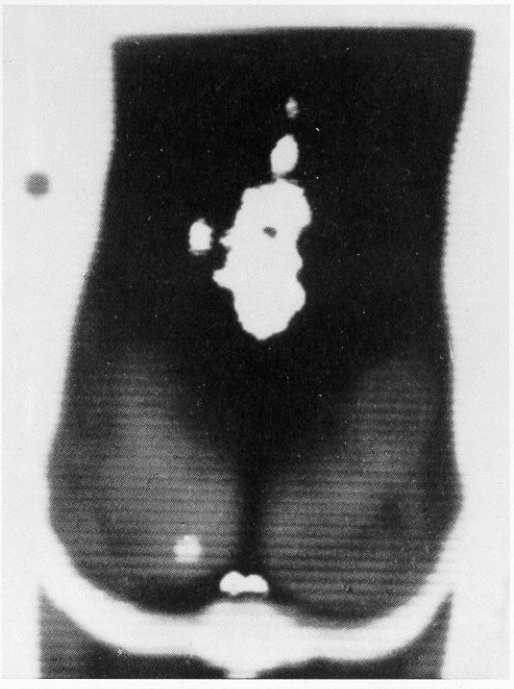

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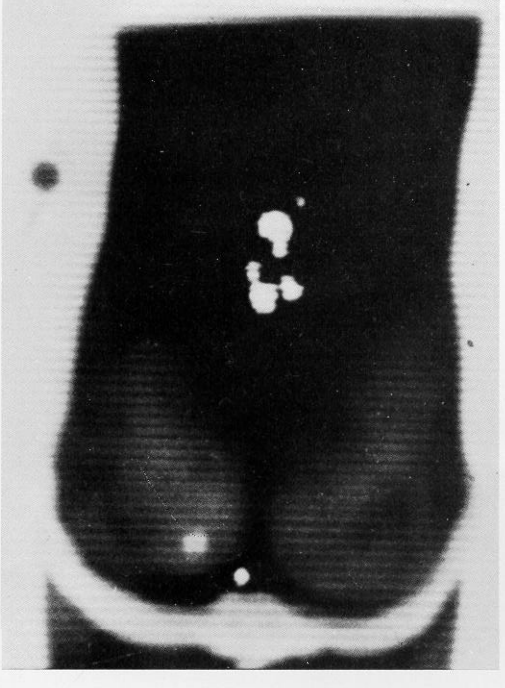

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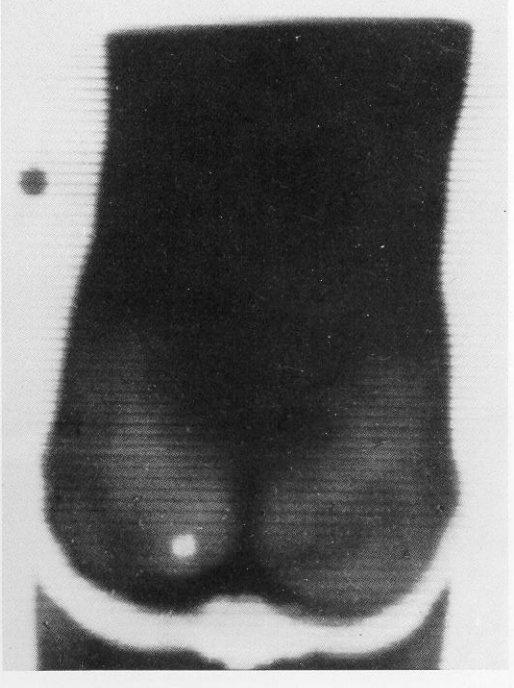

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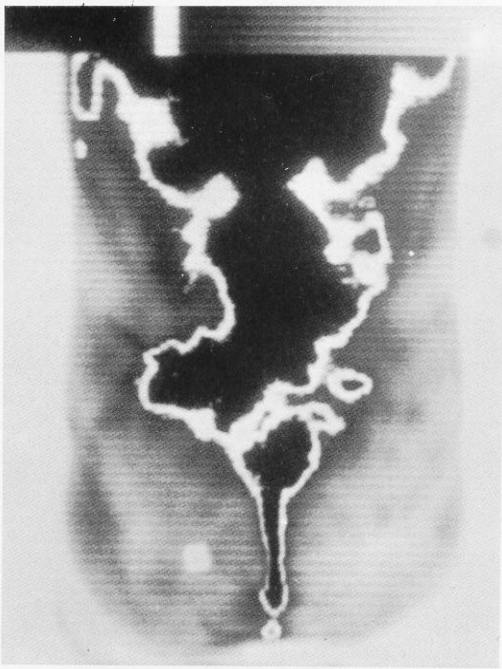
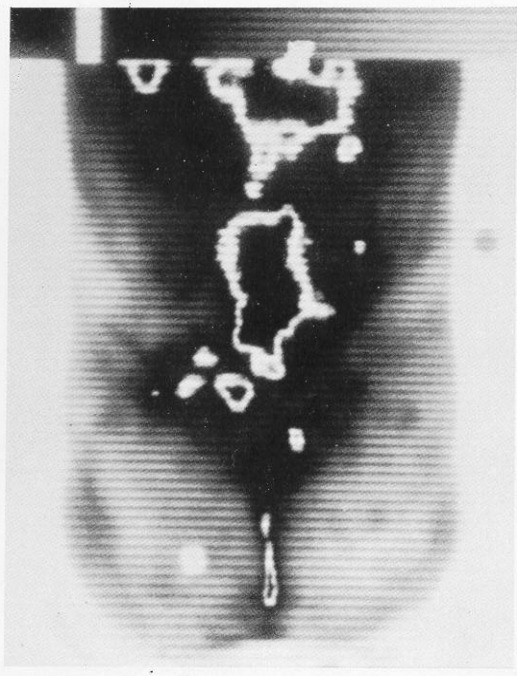
Fig. 5 E-F-G-H.



A



C

Fig. 6 A-B-C.

of the sacroiliac **region** of a normal subject. The isotherms shows that the lowest temperature was in the region of the buttocks and the highest temperature in the lumbar region. The temperature of sacroiliac region on the right and left side was the same.

Figure 6 is a thermogram of a male with ankylosing spondylitis. The isotherms shows a relatively high temperature over the sacroiliac joints and the asymmetry of temperature above the right and left side.

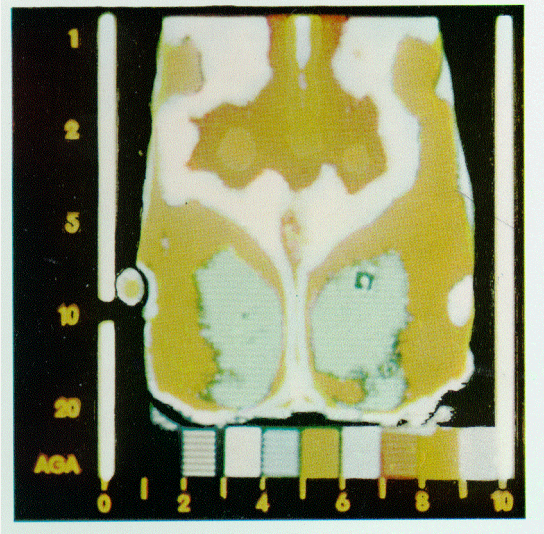


Fig. 7.

Figure 7 shows the lumbosacral region of an ankylosing spondylitis patient.

Figure 8 shows symmetry and raised temperature over the lumbar spine and sacroiliac region in an ankylosing spondylitis patient.

Figure Y shows asymmetric changes in the right and left sacroiliac region in an ankylosing spondylitis patient.

In some ankylosing spondylitis patients the scintillography with technetium 99 was performed. The ratio of isotope uptake of the sacroiliac joints and the middle of the tibia1 bone was calculated. A comparison of the results of both isotopic and thermographic examination showed a statistically significant correlation between the temperature over the sacroiliac region and the value of isotope index (Table V).

Tab. V. Correlation between tbermograpbic and radionuclide examinations of sacroiliac joints.

N. of joints	*Average temp. over sacroiliac joints*	*Average radio-rzuclide index*	*r*	*p*
30	*33*	*7,6*	*0,427*	*<0,05*

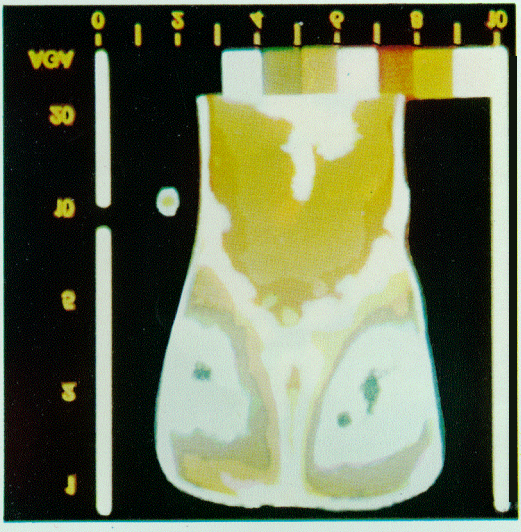


Fig. 8.

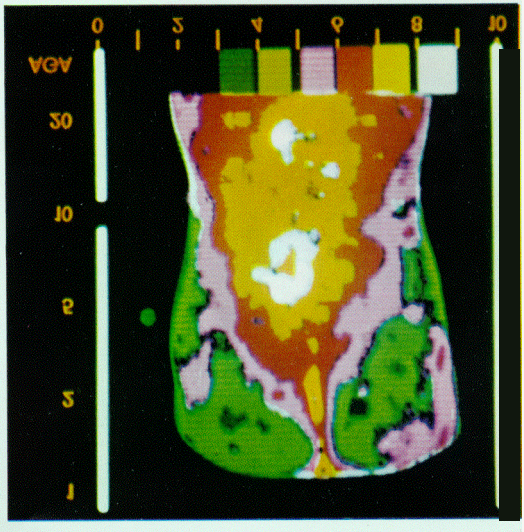


Fig. 9.

Conclusions

1. In healthy persons the curve obtained from the temperature of the lumbosacral region has characteristic and symmetric form.

2. In ankylosing spondylitis patients the shape of the temperature curve in the lumbosacral region is different and often asymmetrical.

3. There are no statistically significant differences in the temperature of the lumbosacral region in ankylosing spondylitis patients and healthy persons.

4. Thermographic examination of sacroiliac region is difficult and needs further study but may give some additional information for the evaluation of the disease.

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