CHAPTER IV

RESULTS

I. Comparative evaluation of healing area in control rats, burn wound-rats, NSS-treated burn wound-rats and aloe-treated burn wound-rats

Changes of healing areas were evaluated by percentage in control rats, burn wound-rats, NSS-treated burn wound-rats and aloe-treated burn wound-rats on the seventh and fourteenth days. Mean values and standard errors of means were presented in table 4.1 and figure 4.1.

The results of these changes of healing areas indicated that:

1. On the seventh day, percentages of healing areas in burn wound-rats, NSS-treated burn wound-rats and aloe-treated burn wound-rats were significantly lower than that of control rats. There was no significant difference between the percentage of healing area in burn wound-rats and NSS- treated burn wound-rats. However, percentage of healing area in aloe-treated burn wound-rats was significantly higher than those of burn wound-rats and NSS- treated burn wound-rats. These data represented that on the seventh day, aloe vera treated burn wound-rats healed faster than that treated with NSS.

2. On the fourteenth day, in burn wound-rats and NSS-treated burn wound-rats showed the same manner of changes of healing area as those observed in burn wound-rats and NSS-treated burn wound-rats on the seventh day. There was no significant difference between aloe-treated burn wound-rats and control rats. These data represented that on the fourteenth day, aloe

vera-treated burn wounds healed almost completely and the healing time was shorter as compared to NSS-treated burns and untreated burns.

II. Studies of second-order arteriolar changes in control rats, burn wound-rats, NSS-treated burn wound-rats and aloe-treated burn wound-rats

As shown in figures 4.5-4.6, the diameters of second-order arterioles were determined on the seventh and fourteenth days. Means and standard errors of means were presented in table 4.2 and figure 4.2

The results of these second-order arteriolar changes indicated that:

1. On the seventh day, the arteriolar diameter in burn wound-rats increased largely with significant difference as compared to control rats. In aloe-and NSS-treated burn wound-rats, vasodilation was reduced significantly, but extension of the reduction was more in aloe-treated burn wound rats than in NSS-treated burn wound rats. In aloe-and NSS-treated burn wound rats, there was not significant difference in arteriolar diameter as compared to control rats.

2. On the fourteenth day, the arteriolar diameters of burn wound-rats reduced largely with significant difference as compared to control rats. The arteriolar diameters of NSS-treated burn wound-rats enhanced slightly but there was significant difference from control rats. Only the arteriolar diameters of aloe-treated burn wound rats was not significantly different form those of control rats.

there was significant difference as compared to control rats. In burn wound-rats, arteriolar diameter was not significant difference from NSS-treated burn wound rats. Only aloe-treated burn wound-rats enhanced markedly with significant difference as compared to burn-and NSS-treated burn wound rats but there was not significant difference form control rats.

These data represented that on the seventh day after burn, marked vasodilation occurred. Aloe vera reduced vasodialtion better than NSS and only aloe vera reduced vasodilation to normal condition. On the fourteenth day after burn, vasoconstriction was observed. Only aloe vera enhanced arteriolar diameter to normal condition. It is noted that aloe vera attempted to maintain ateriolar changes during one week and two weeks after burn.

IV. Studies of the permeability of postcapillary venules

As shown in figures 4.7, there was leakage of fluorescein dye from the intravascular compartment of postcapillary venule into extravascular space. The permeability of postcapillary venule was determined as intensity value at the eleventh and thirtieth minutes after fluorescence injection. Means and standard errors of means of these intensity values presented in table 4.4 and figure 4.4.

The results of these intensity values indicated that:

1. On the seventh day, the intensity value in burn wound rats was increased significantly as compared to control rats. In aloe-and NSS-treated burn wound-rats, the intensity values were decreased significantly as compared to control rats. However, the intensity value in aloe-treated burn

wound rats was significantly different from those of NSS-treated burn wound-rats and burn wound-rats.

2. On the fourteenth day, the intensity values in burn wound-rats and NSS-treated burn wound-rats were reduced significantly as compared to control rats. There was no significant difference between those of aloe-treated burn wound-rats and control rats.

V. Studies of the leukocyte-endothelium interaction in postcapillary venule

Leukocytes sticking and tortuousity of postcapillary venules were observed. From the above data of intensity values on the seventh day, in control rats were found the absence of fluorescein dye. In parallel, this group was found the absence of tortuousity of postcapillary venules, and leukocytes did not interact with the endothelial surface of postcapillary venule as shown in figures 4.8 and 4.9, respectively. In burn wound-rats, plasma leakage was much more than those of the other groups. The most tortuousity of capillaries and postcapillary venules was observed in untreated groups as shown in figure 4.8. It is noted that accumulation of leukocytes sticking and transmigration of leukocytes into the interstitium were not different among groups of burn wound rats, NSS-treated burn wound-rats and aloe-treated burn wound-rats as shown in figure 4.9. The tortuousity of aloe-treated burn wound-rats was less than that of NSS-treated burn wound-rats as shown in figure 4.8

Leukocyte sticking in burn wound-rats had more than NSS-treated burn wound-rats as shown in figure 4.10. Only aloe-treated burn wound rats was the fewest leukocyte sticking as shown in figure 4.9

These data represented that on the seventh day after burn, marked vasodilation occured. Aloe vera reduced vasodilation better than NSS and both of these agents reduced vasodilation to normal condition. On the fourteenth day after burn, vasoconstriction was observed. Only aloe vera increased arteriolar diameter to normal condition. It is noted that the healing area of aloe vera-treated group was more than those of NSS-treated and untreated group, which related to maintain normal arteriolar condition during one and two weeks after burn.

III Studies of third-order arteriolar changes in control rats, burn wound-rats,NSS-treated burn wound-rats and aloe-treated burn wound-rats

As shown in figures 4.5-4.6, the diameters of third-order arterioles were determined on the seventh and fourteenth days. Means and standard errors of means were presented in table 4.3 and figure 4.3.

These results of these third-order arteriolar changes indicated that:

1. On the seventh day, the arteriolar diameter in burn wound-rats increased largely with significant difference as compared to control rats. The arteriolar diameter in NSS-treated burn wound-rats reduced slightly with significant difference as compared to burn wound-rats and control rats. The arteriolar diameter in aloe-treated burn wound-rats reduced markedly with significant difference as compared to burn wound-rats and NSS-treated burn wound-rats. But there was not significant difference from control rats.

2. On the fourteenth day, the arteriolar diameters in burn wound-rats reduced largely with significant difference as compared to control rats. The arteriolar diameters in NSS-treated burn wound-rats enhanced slightly but

Besides in present experiment, angiogenesis was found in burn wound-rat on the seventh-and fourteenth days after burning as shown in figure 4.11

Table 4.1 Percentages of healing area in control rats , burn wound- rats , NSS- treated burn wound- rats , and aloe- treated burn wound- rats on days 7, 14 after burn

Group	Healing area (mm^2)			
	Control	Burn	NSS	Aloe
Days 7	100	$20.49^{*} \pm 2.53$	$26.15^{*\,NS} \pm 2.94$	$53.45^{*\bullet\circ} \pm 3.24$
Days 14	100	$37.42^{*} \pm 0.41$	$53.69^{*\bullet} \pm 3.65$	$92.23^{NS\bullet\circ} \pm 1.50$

Data are the mean ± SEM

* Significant difference as compared to control ($p < 0.05$)

● Significant difference as compared to burn ($p < 0.05$)

○ Significant difference as compared to NSS ($p < 0.05$)

NS No significant difference as compared to burn

NS No significant difference as compared to NSS

Table 4.2 Changes in second - order arteriolar diameter in control rats , burn wound - rats , NSS- treated burn wound - rats , and aloe- treated burn wound- rats on days 7,14 after burn

Group	Second -order arteriolar diameter (μm)			
	Control	Burn	NSS	Aloe
Days 7	77.40 ± 2.82	* 129.35 ± 15.69	NS● 90.84 ± 4.84	NS ○○ 68.78 ± 3.28
Days 14	77.40 ± 2.82	* 5.92 ± 5.92	* ● 46.00 ± 1.15	NS ●○ 85.69 ± 7.78

Data are the mean ± SEM

* Significant difference as compared to control ($p < 0.05$)

● Significant difference as compared to burn ($p < 0.05$)

○ Significant difference as compared to NSS ($p < 0.05$)

NS No significant difference as compared to burn

NS No significant difference as compared to NSS

Table 4.3 Changes in third - order arteriolar diameter in control rats , burn wound - rats , NSS- treated burn wound - rats ,and aloe- treated burn wound- rats on days 7,14 after burn

Group	Third - order arteriolar diameter (μm)			
	Control	Burn	NSS	Aloe
Days 7	66.47 ± 2.18	105.47 * ± 4.20	85.80 * ● ± 3.19	56.58 NS ○ ○ ± 2.79
Days 14	66.47 ± 2.18	14.04 * ± 6.74	27.22 * NS ± 2.67	65.96 NS ● ○ ± 10.48

Data are the mean ± SEM

* Significant difference as compared to control ($p < 0.05$)

● Significant difference as compared to burn ($p < 0.05$)

○ Significant difference as compared to NSS ($p < 0.05$)

NS No significant difference as compared to burn

NS No significant difference as compared to NSS

Table 4.4 Changes in intensity value of postcapillary venule in control rats , burn wound - rats , NSS- treated burn wound - rats , and aloe- treated burn wound- rats on days 7,14 after burn

Group	Intensity value			
	Control	Burn	NSS	Aloe
Days 7	0	1.06 *	0.52 * ●	0.24 * ● ○
Days 14	0	0.30 *	0.27 * NS	0 NS ● ○

Data are the mean ± SEM

* Significant difference as compared to control ($p < 0.05$)

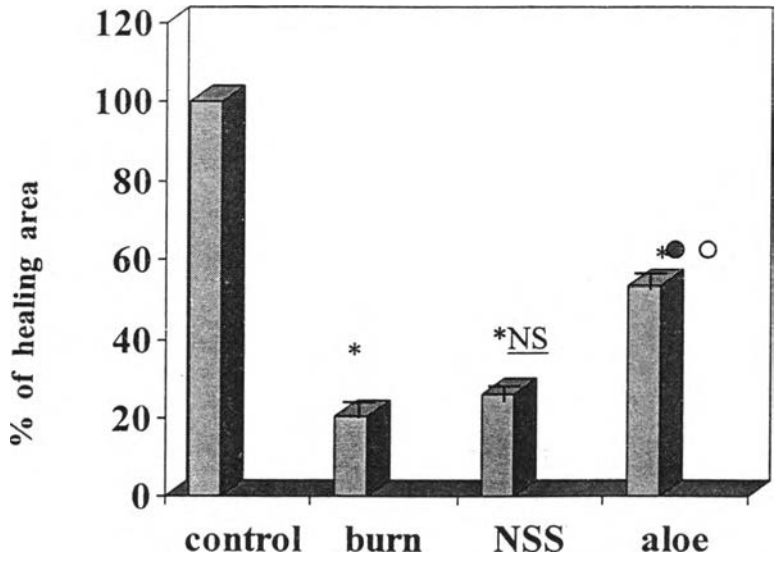
● Significant difference as compared to burn ($p < 0.05$)

○ Significant difference as compared to NSS ($p < 0.05$)

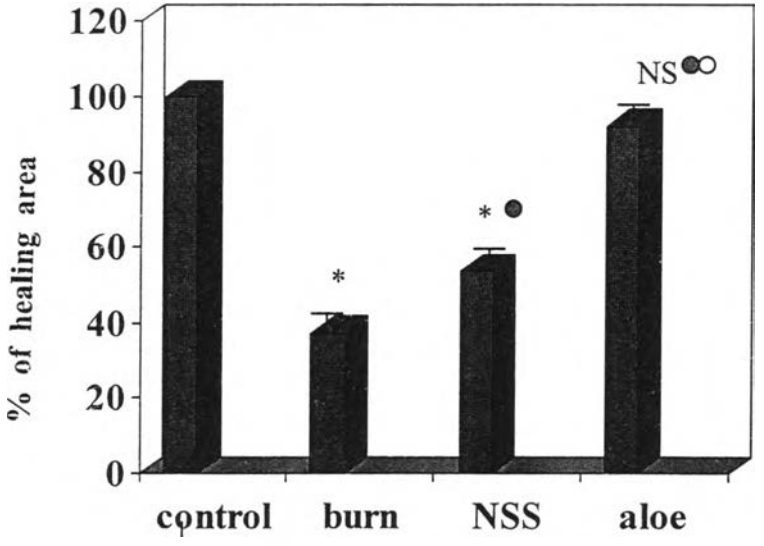
NS No significant difference as compared to burn

NS No significant difference as compared to NSS

FIGURE 4.1 Means and SEM of percentages of healing area in control rats, burn wound - rats, NSS-treated burn wound -rats and aloe - treated burn wound - rats on days 7, 14 after burning



Day 7



Day 14

* Significant difference as compared to control ($p < 0.05$)

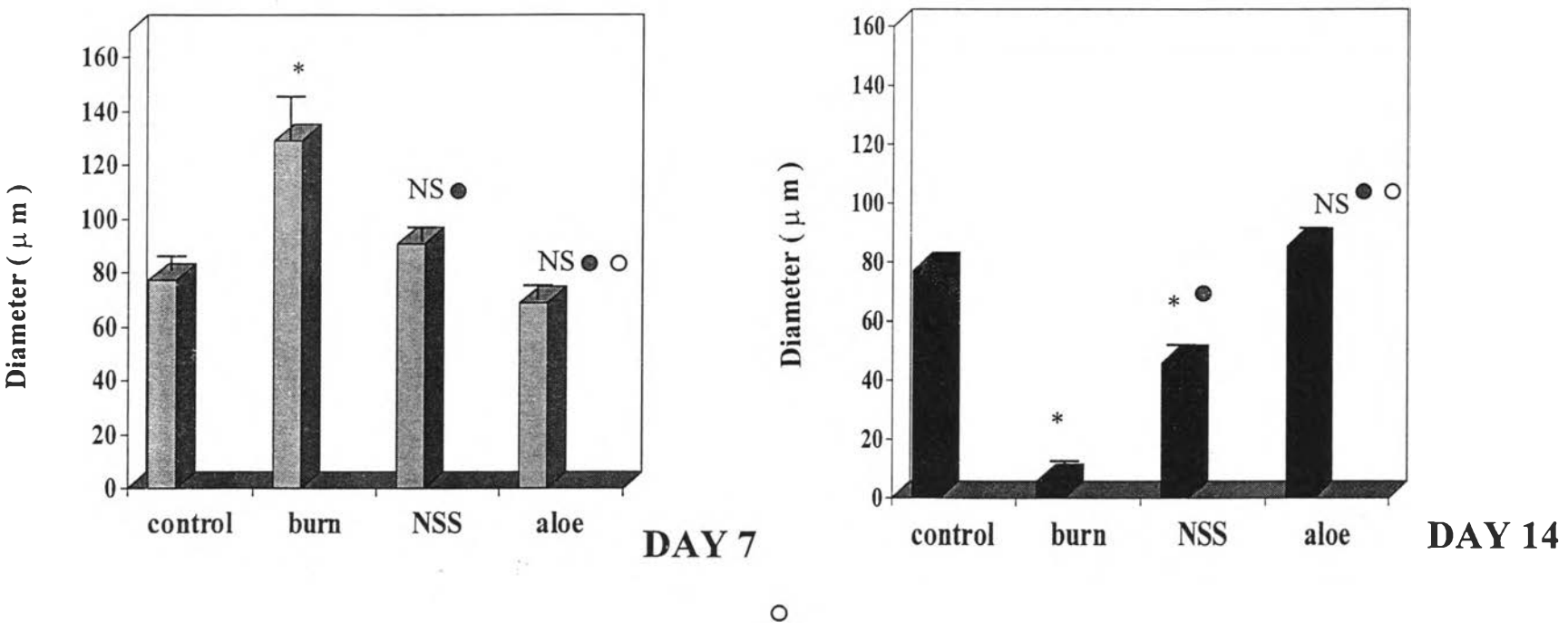
● Significant difference as compared to burn ($p < 0.05$)

○ Significant difference as compared to NSS ($p < 0.05$)

NS No significant difference as compared to burn

NS No significant difference as compared to control

FIGURE 4.2 Means and SEM of changes in second- arteriolar diameter in control rats, burn wound - rats, NSS- treated burn wound- rats and aloe -treated burn wound-rats on days 7, 14 after burning



○

* Significant difference as compared to control ($p < 0.05$)

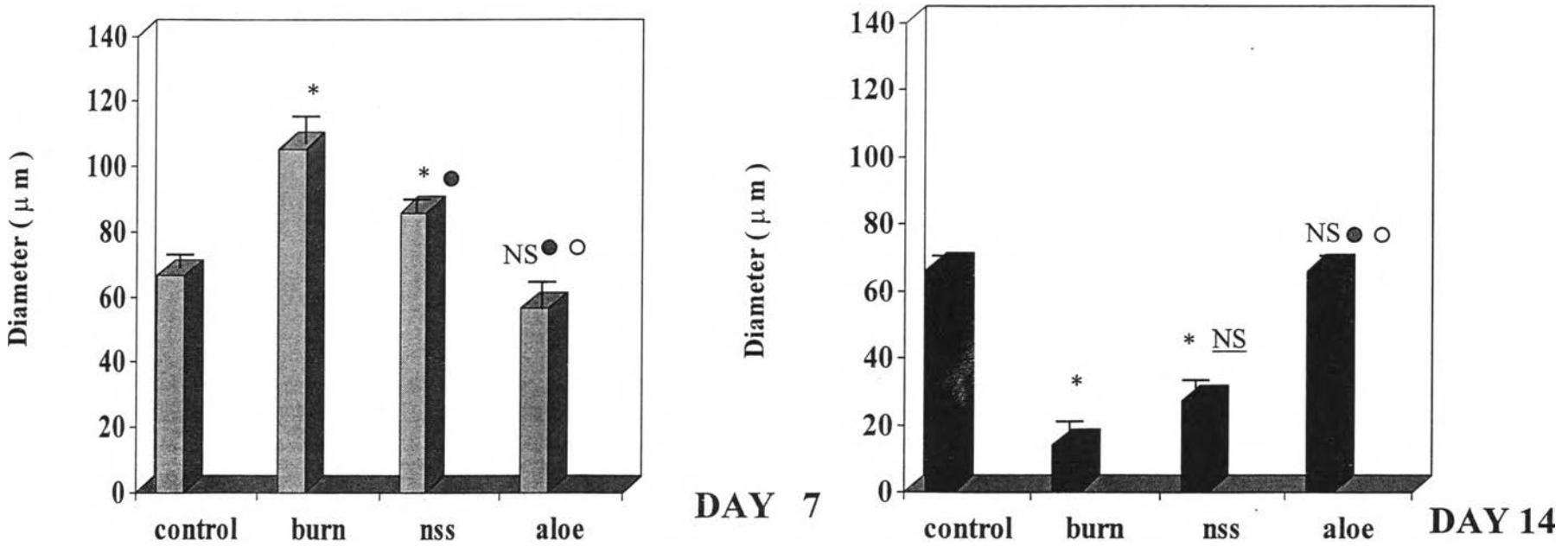
● Significant difference as compared to burn ($p < 0.05$)

○ Significant difference as compared to NSS ($p < 0.05$)

NS No significant difference as compared to burn

NS No significant difference as compared to control

FIGURE 4.3 Means and SEM of changes in third - arteriolar diameter in control rats, burn wound - rats, NSS- treated burn wound- rats and aloe -treated burn wound-rats on days7, 14 after burn



* Significant difference as compared to control ($p < 0.05$)

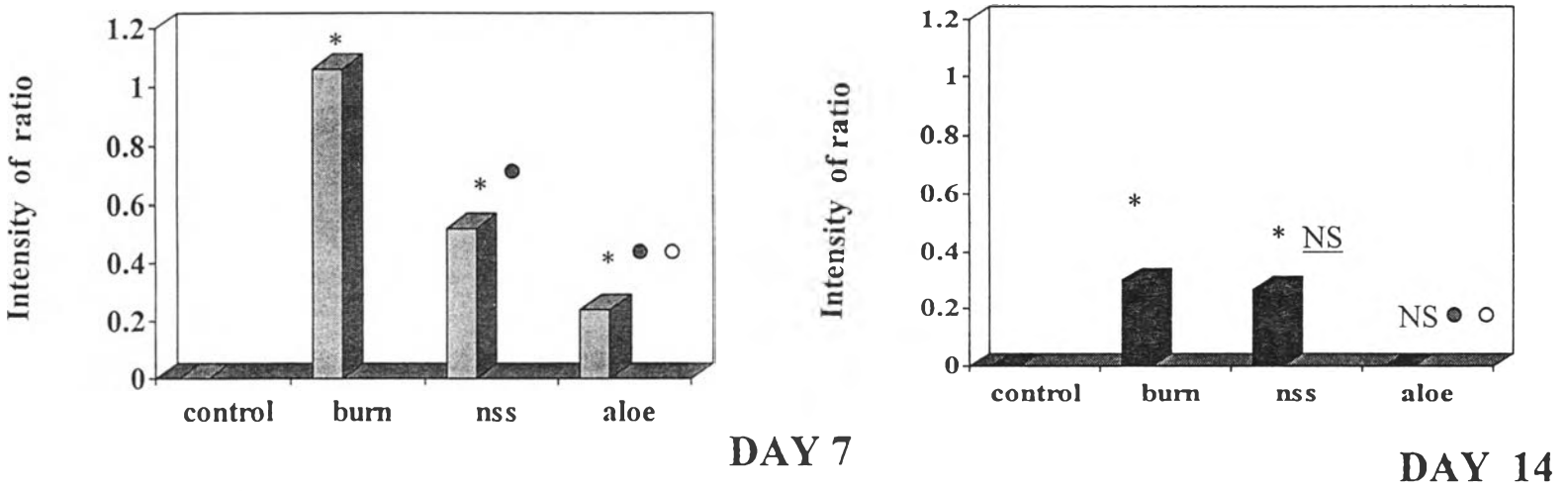
● Significant difference as compared to burn ($p < 0.05$)

○ Significant difference as compared to NSS ($p < 0.05$)

NS No significant difference as compared to burn

NS No significant difference as compared to control

FIGURE 4.4 Means and SEM of changes in intensity ratio of postcapillary venule in control rats, burn wound- rats, NSS- treated burn wound- rats, and aloe- treated burn wound- rats on days 7, 14 after burn



* Significant difference as compared to control ($p < 0.05$)

● Significant difference as compared to burn ($p < 0.05$)

○ Significant difference as compared to NSS ($p < 0.05$)

NS No significant difference as compared to burn

NS No significant difference as compared to control

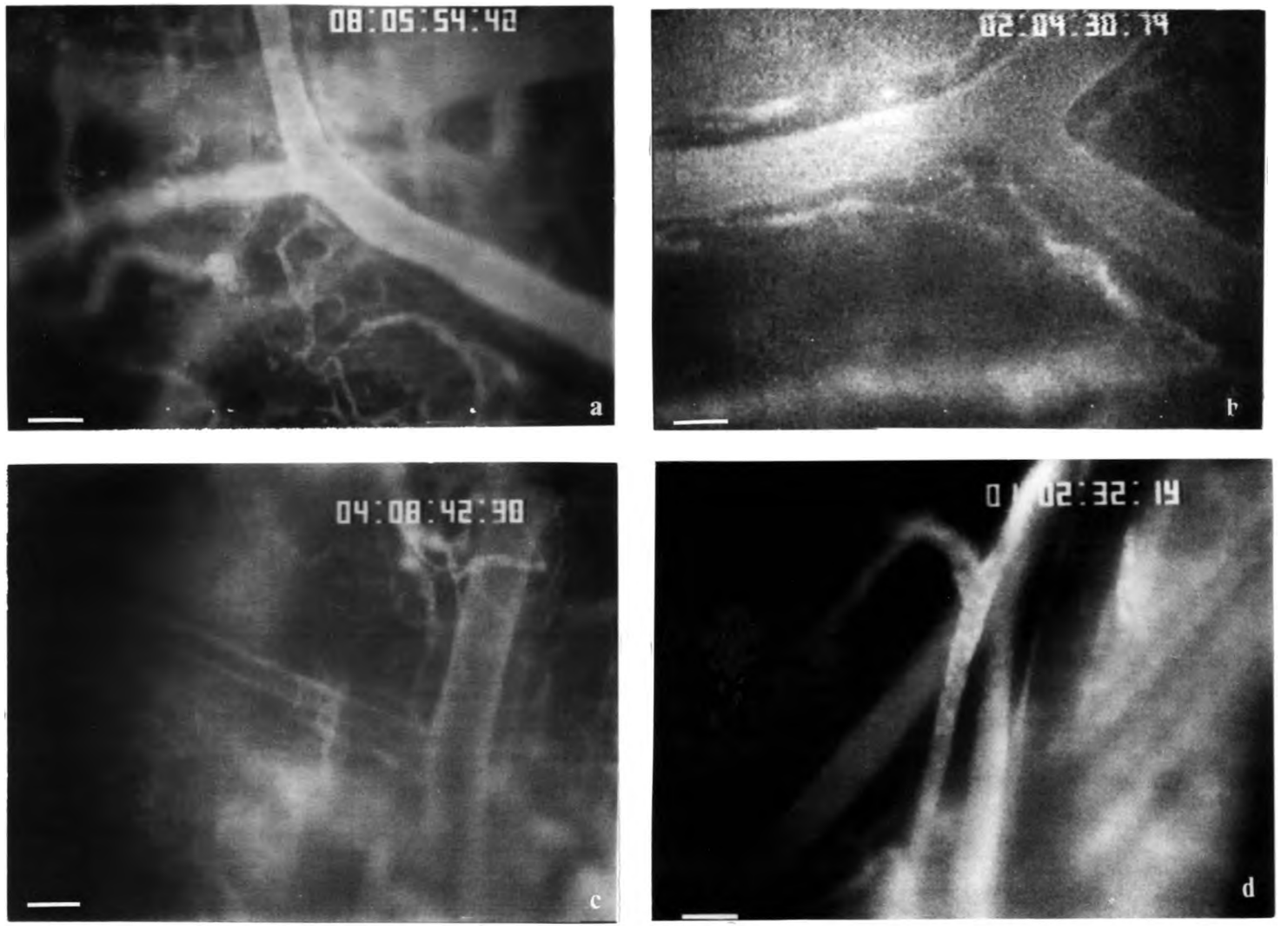


Figure 4.5 Video microscopic image of subscutaneous vessels demonstrated the diameter changes of second (2A)-and third (3A)- order arterioles in control rats (a), burn wound-rats (b), NSS-treated burn wound-rats (c),and aloe-treated burn wound rats (d) on day 7. Bar represent 100 µm.(x 10)

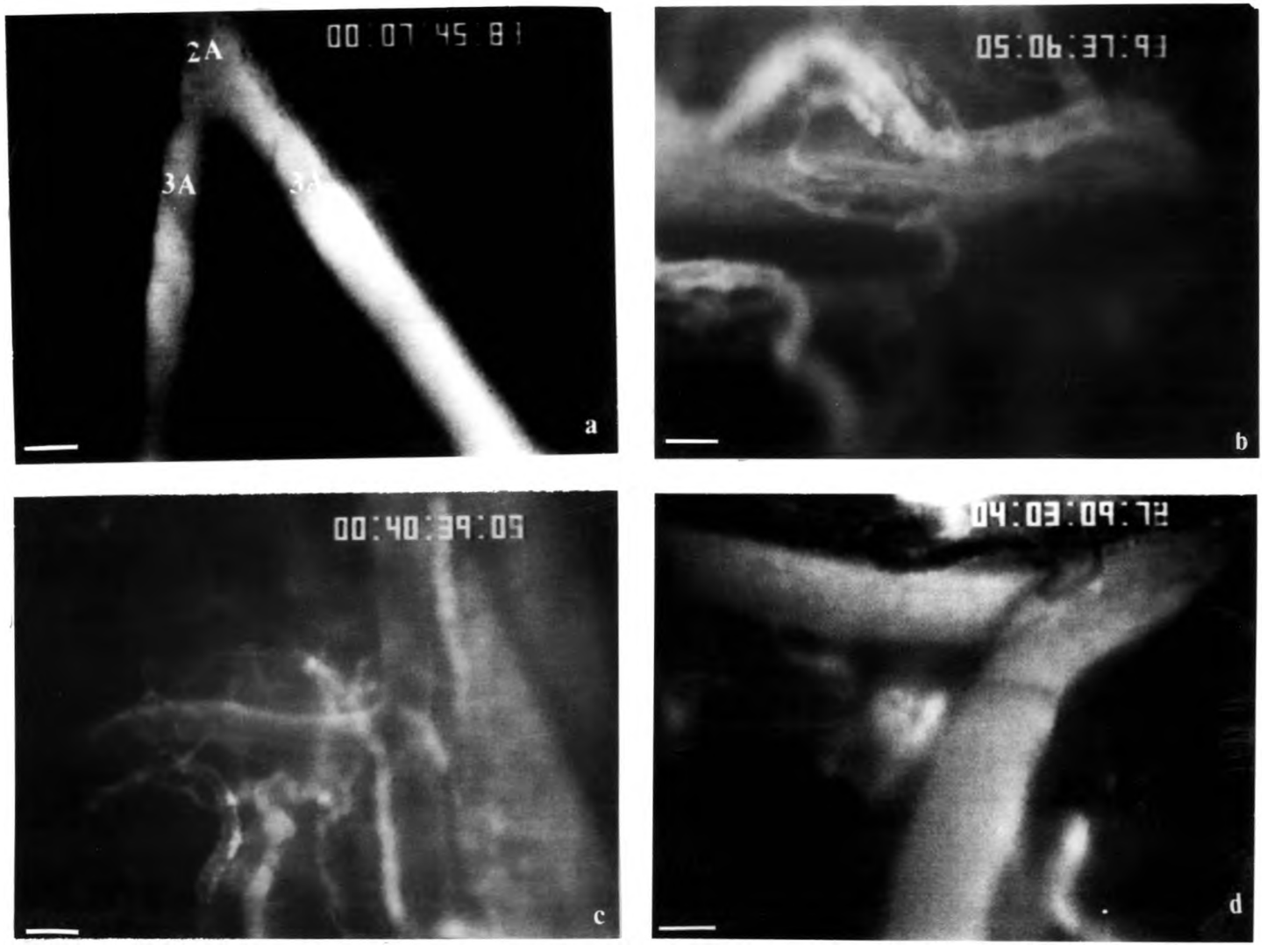


Figure 4.6 Video microscopic image of subscutaneous vessels demonstrated the diameter changes of second (2A)-and third (3A)- order arterioles in control rats (a), burn wound-rats (b), NSS-treated burn wound-rats (c),and aloe-treated burn wound rats (d) on day 14. Bar represent 50 μm.(x 20)

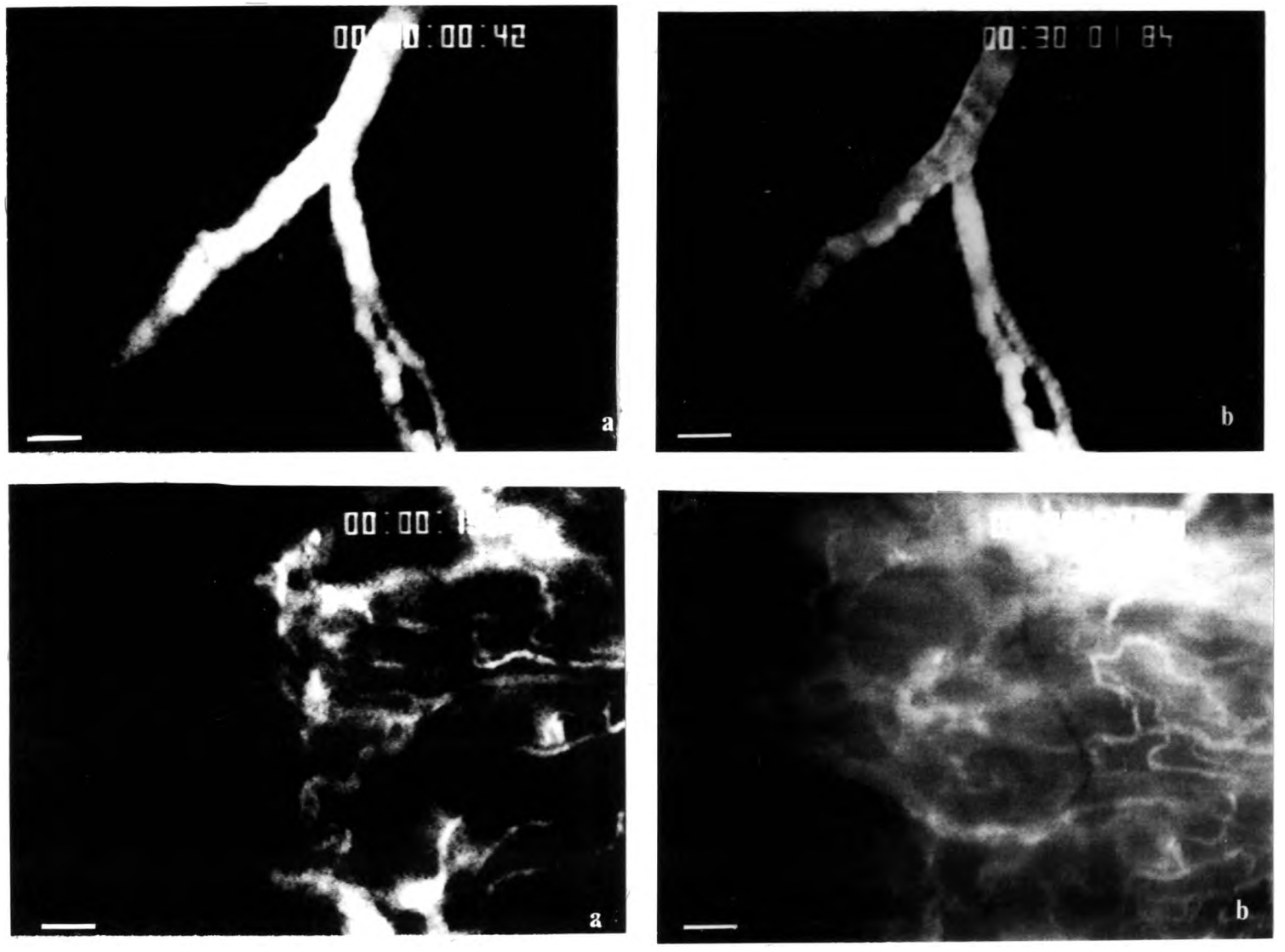


Figure 4.7 Video microscopic image of subscutaneous vessels demonstrated the plasma leakage in control rats (A), burn wound-rats (B),at time zero(a) and thirty minutes (b) after FITC –dx –150 administration . Bar represent 50 μm.(x 20)

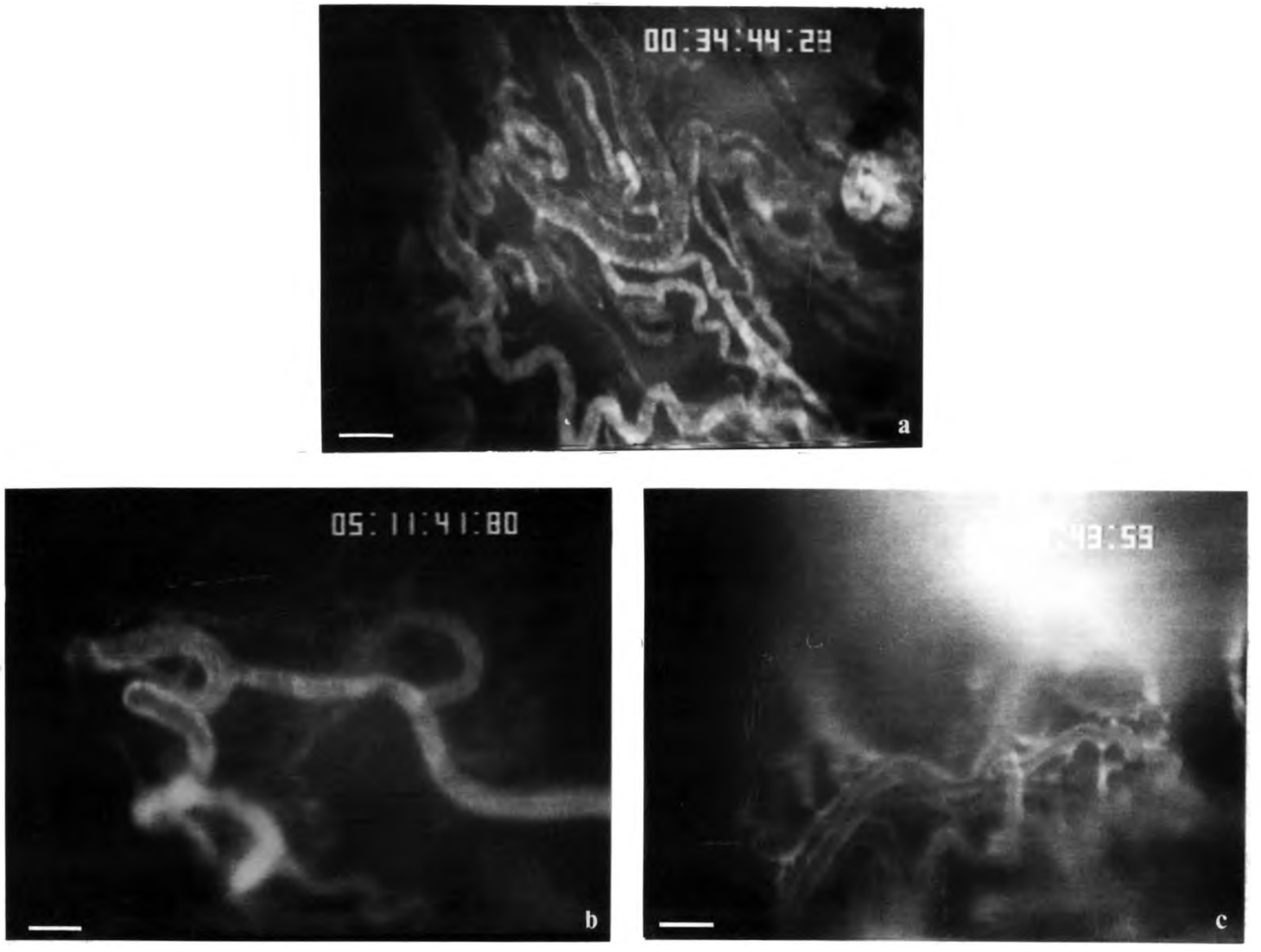


Figure 4.8 Video microscopic image of subscutaneous vessels demonstrated the tortuousity in burn wound-rats (a), NSS-treated burn wound-rats (b),and aloe-treated burn wound rats (c) on day 7. Bar represent 100 μm. (x 10)

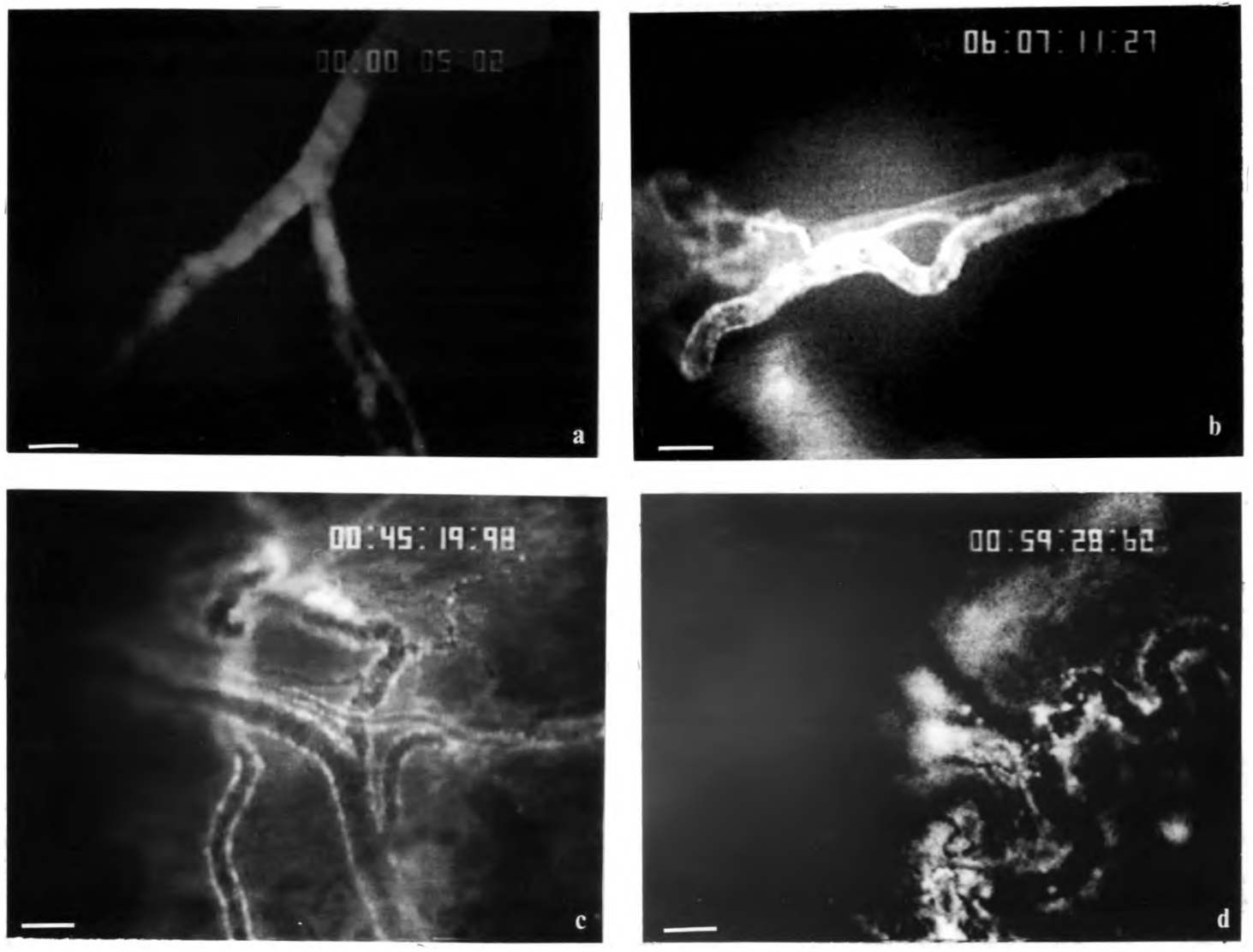


Figure 4.9 Video microscopic image of subscutaneous vessels demonstrated leukocyte adhesion in control rats (a), burn wound-rats (b), NSS-treated burn wound-rats (c),and aloe-treated burn wound rats (d) on day 7. Bar represent 50 μm. (x 20)

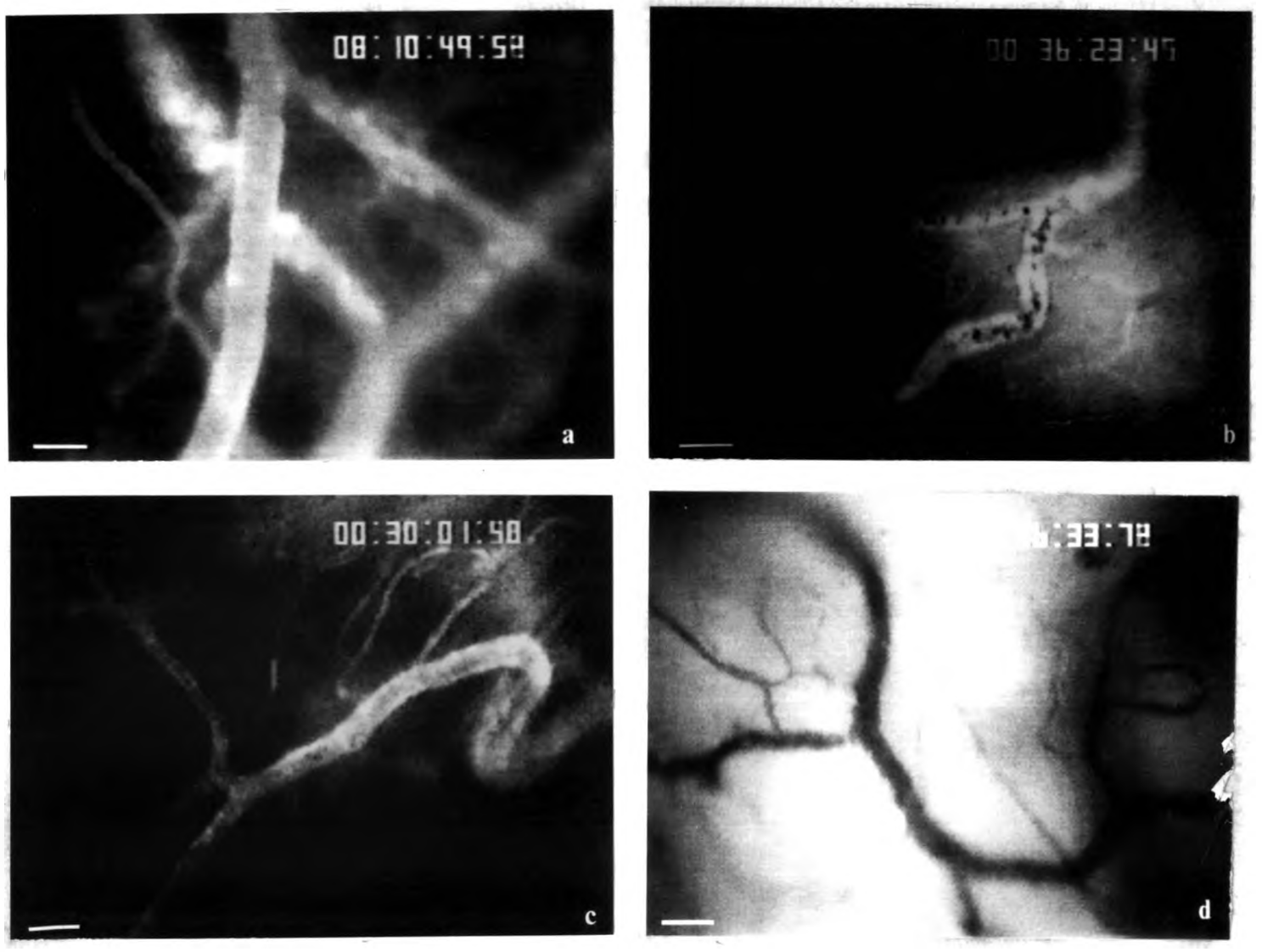


Figure 4.10 Video microscopic image of subscutaneous vessels demonstrated leukocyte adhesion in control rats (a), burn wound-rats (b), NSS-treated burn wound-rats (c),and aloe-treated burn wound rats (d) on day 14.Bar represent 50 μm. (x 20)

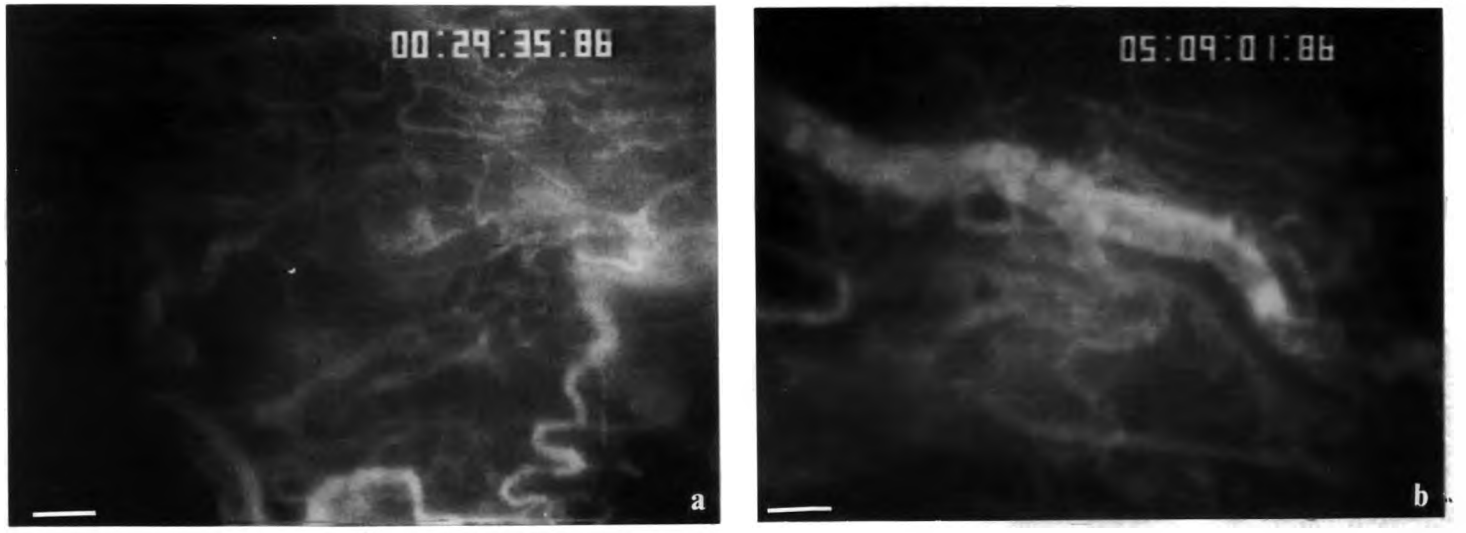


Figure 4.11 Video microscopic image of subscutaneous vessels demonstrated angiogenesis in burn wound-rats (a) on day 7and burn wound- rats on day 14. Bar represent 50 μm. (x 20)