

Glutathione

= Abstract =

The Significance of Lipid Peroxidation and Glutathione in Reflux Esophagitis of Rats

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The role of oxygen-derived free radicals has been studied in acute gastric and esophageal mucosal injury. **Objectives:** The aim of this study was to determine whether acid reflux causes oxidative stress in the esophageal mucosa and to investigate the correlation between mucosal glutathione (GSH) levels as an endogenous free radical scavenger and lipid peroxidation. **Methods:** Eight-week-old male Sprague-Dawley rats with a bodyweight of 250-300 g were used for the experiments. Acid reflux was caused by pyloric ligation. The sham operation included a midline laparotomy and served as controls. After 24 hr all rats were killed and esophageal samples were taken for measurement of gross mucosal injury and mucosal GSH level. Lipid peroxidation which is a marker of oxidative stress was determined by measuring the formation of thiobarbituric acid-reactive substances (TBARS) spectrophotometrically. **Results:** Severe mucosal damage was noted in reflux group. TBARS level was 6 times greater in reflux group compared to the control group ($P<0.05$), while GSH level was 4 times less in reflux group compared to the control group ($P<0.05$). Increase of TBARS level and decrease of GSH level showed a strong correlation to the gross findings of esophageal mucosal damage in reflux esophagitis. **Conclusions:** Oxygen-derived free radicals are of pathophysiologic importance in esophagitis caused by acid reflux. (*Korean Journal of Gastrointestinal Motility 2001;7:175-180*)

Key Words: Reflux esophagitis, Free radical, Glutathione, Lipid peroxidation

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가
 superoxide, hydroxy radical
 (free radical) / ,¹
 , , ,
 ,
 ,

가 , 300 gm 3 Sprague-Dawley .
 ,
 .⁵ 2.
 1)
 (scavenger) .⁶ 24 ,
 24
 , superoxide anion
 superoxide dismutase (SOD) ,
 hydrogen peroxide catalase , hypochlorous
 hydroxyl free radical allopurinol (n=6),
 .^{7,8} 1995 Wetscher⁹ - (n=7).
 24 mesh-bottom cage 24
 SOD 24
 ketamine (xiphoid)
 10
 가 0.9% NaCl
 , , ,
 Glutathione (GSH) .
 ,¹⁰
 hydrogen peroxide H₂O
 ,
 가 GSH ,
 가 .¹¹
 가
 , -
 thiobarbituric acid-
 reactive substance
 glutathione .

300 gm 3 Sprague-Dawley .
 ,
 .⁵ 2.
 1)
 (scavenger) .⁶ 24 ,
 24
 , superoxide anion
 superoxide dismutase (SOD) ,
 hydrogen peroxide catalase , hypochlorous
 hydroxyl free radical allopurinol (n=6),
 .^{7,8} 1995 Wetscher⁹ - (n=7).
 24 mesh-bottom cage 24
 SOD 24
 ketamine (xiphoid)

0.9% NaCl
 , , ,

2) Biochemical assay

, 70
 ,
 glutathione .
 1. Buerge Augt¹²
 malonyldial-
 dehyde (MDA)가 thiobarbituric acid (TBA)
 thiobarbituric acid-reactive
 substances (TBARS) .
 0.1 M Tris-HCl (pH 7.4)
 10% 200 μL
 20% acetic acid (pH 3.5)

400 μL 0.8% 2-thiobarbituric acid 400 μL
 8% sodium dodecyl sulfate
 95 60 가 . 13,000 × g
 15 535
 nM
 2. glutathione Adams 13
 5, 5'-dithiobis-(2-nitrobenzoic acid)(DTNB)-
 glutathione reductase recycling method
 micromoles/gram of tissues . 6
 0.1M Tris-
 HCl (pH 7.4) 10%
 10% 5-sulfosalicylic acid
 4 12,500 g 5
 6.3 mM EDTA
 phosphate buffer (125 mM, pH 7.5)
 10 5 units/mL GSH reductase 6 mM
 5, 5'-dithiobis-(2-nitrobenzoic acid) 가 .
 0.3 mM NADPH .
 412 nM
 3) ± . Two
 tailed non-parametric statistics
 Mann-Whitney U test
 Pearson product moment
 correlation test
 p<0.05
 1.
 2. GSH
 가 TBARS
 124.1 ± 24.0 nM/g tissue (19.4 ±
 4.9 nM/g tissue) 6 가
 (Fig. 1) (p<0.05). GSH
 (72.0 ± 31.4 nMg/g tissue) (334.2 ±
 93.3 nM/g tissue) 4
 (Fig. 2) (p<0.05).
 TBARS 가 GSH
 (r=-0.494; p<0.05).

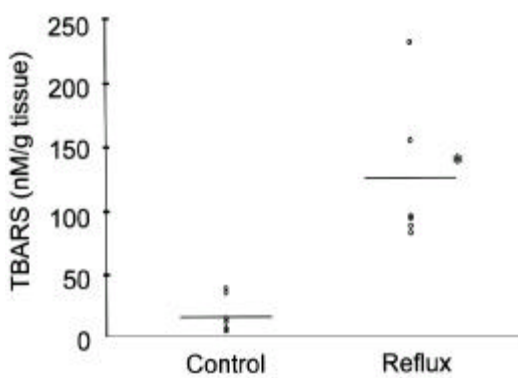


Fig. 1. Comparison of lipid peroxidation between control and reflux group. TBARS level was 6times greater in reflux group compared to the control group. TBARS, thiobarbituric acid-reactive substances; *, p < 0.05.

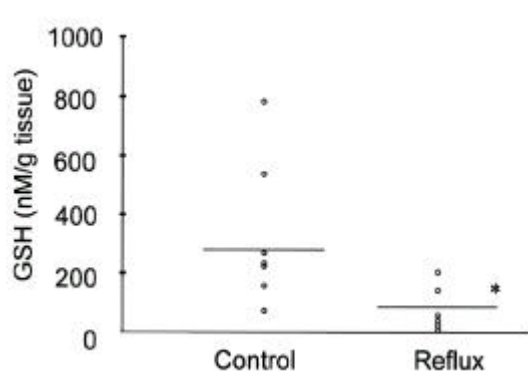


Fig. 2. Comparison of mucosal glutathione levels between control and reflux group. GSH level was 4 times less in reflux group compared to the control group. GSH, glutathione; *, p < 0.05.

가 가 ,

가
Superoxide anion
, 1995

Wetscher ⁹ SOD superoxide anions
가 69%

가 가 , GSH
가 . Catalase hydrogen peroxide
가 56%

, , SOD 가

, , Catalase SOD
가 , SOD
가

가 ^{9,11} , 가 , hydrogen peroxides
,
SOD , 56%

⁹
Glutathione (GSH)
,
¹⁴ ^{6,10} GSH
MDA가 TBA
TBARS ^{6,10,16}
,
2 GSH 가 가 ^{17,18}
GSH , GSH
가 가
가 가
GSH가 , negative feedback mechanism
gamma-glutamylcysteine synthase
GSH ¹⁰ ,
, GSH
가 가 . 24
,

GSH

가

GSH 가

^{9,11,20}
superoxide anion

GSH

SOD

2-4

가 4

⁹, Nissen fundoplication

가

12

SOD 가

가

¹¹

24

GSH

GSH 가

¹⁵

,

,

,

가

GSH

가

가

,

가

:

가

GSH가

가

thiobarbituric acid-reactive
glutathione

(1/3)

substance

¹¹

GSH가

2/3

1/3

: 300 gm

,

1/3

3

Sprague-Dawley

24

가

GSH

: 1.

6

. 2.

가 TBARS

^{15,19}

, 가

6

가 (p<0.05).
 GSH 4
 (p<0.05).
 TBARS
 가 GSH
 (p<0.05). : 가

Glutathione

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