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Screening pathological study for pulmonary lesions in slaughtered cattle in Al-Najaf abattoir

Zahraa F. Mandeel* Researcher
Ahmed H. Al-Dabhawi Assistant Professor
Faculty of Veterinary Medicine, University of Kufa
Correspondence: ahmedh.al-azaam@uokufa.edu.iq. Mobile no. 00964782325685

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Abstract

This study was conducted in Al-Najaf slaughterhouse, during the period from January to March 2019 to investigate and classify the microscopic changes of pulmonary lesions and comparison between the percentage of different lesions in lung of slaughtered young and adult cattle. Two hundred and twenty cattle were postmortem examined, The specimens from their lung were collected and preserved in buffered formalin 10% and routine staining with H&E stain and special staining with Masson's Trichrome stain were achieved.The results of the microscopic study showed that there were variable pulmonary affections in slaughtered cattle. The microscopic investigation of the lung specimens stained with hematoxylin and eosin stain showed variation in the occurrence of different microscopic lung lesions, arranged from high percentages such as pleural changes (94.5%), bronchopneumonia (68.5%), pneumonia (57%), emphysema (44%), atelectasis (42%), fibrosis (37%), angiogenesis (35%), congestion (32.5%), consolidation (19.5%), haemorrhage (16.5%), hemosiderin deposition (15.5%), hyperplasia (15%) and desquamation (10%) to moderate to low percentages such as tuberculosis (5.5%), hydropic degeneration (4.5%), oedema (4.5%), hydatid cysts (4%), sclerosis (1.5%), abscesses (1%), metaplasia (0.5%) and thrombosis (0.5%).
The main conclusions of our study revealed that there were different pulmonary lesions could be diagnosed as well as there was significant differences between the prevalence of lung microscopic lesions between young and adult cattle.

Key words: lung, abattoir, pneumonia, bronchopneumonia, postmortem

*Part of M.Sc. Thesis of the first author.

دراسة مسحية إمراضيه للآفات الرئوية في الأبقار المذبوحة في مجزرة النجف

زهراء فليح منديل* باحثة
أحمد حميد الذبحاوي أستاذ مساعد
كلية الطب البيطري – جامعة الكوفة

الخلاصة

أجريت هذه الدراسة في مجزرة النجف الأشرف لغرض معرفة التغيرات الحاصلة والمتعلقة بأمراض الرئة, ومن أجل عمل مقارنة بين نسب الأفات المختلفة التي تصيب الرئة في الأبقار البالغة واليافعة ووضع تصنيف مجهري للأفات الرئوية التي تصيب الأبقار المذبوحة وقد تم أخذ عينات من رئات 220 بقرة كنموذج بعد ان تم ذبحها وتشريحها في مجزرة النجف الأشرف للفترة من شهر كانون الثاني الى شهر آذار/ 2019. حيث تم تحديد أسباب مختلفة لأستبعاد الرئات المصابة.
وقد تم استخدام الصبغة الاعتيادية الهيماتوكسلين والايوسين وصبغة الماسون التر ايكروم في هذه الدراسة من أجل الفحص عن الافات المرضية وكذلك انتشار النسيج الليفي في نسيج الرئة.
أظهر الفحص المجهري للعينات الرئوية بعد تحضير مقاطع نسيجية وصبغها بصبغة الهيماتوكسيلين والايوسين حدوث آفات مجهرية مختلفة يتراوح حدوثها من نسب مئوية عالية كتغيرات غشاء الجنب (94.5%)، الالتهاب القصبي الرئوي (68.5%)، التهاب الرئة (57%), انتفاخ الرئة (44%), انخماص الرئة (42%), التليف (37%)، عملية تكوين اوعية دموية جديدة (35%)، الاحتقان (32.5%)، التصلد الرئوي (19.5%)، النزف (16.5%)، ترسب الهيموسيدرين (15.5%)، تضاعف الخلايا الطلائية (15%)، التقشير (10%) الى نسب مئوية متوسطة أو واطئة كالسل الرئوي (5.5%)، التنكس المائي (4.5%), الوذمة (4.5%), الاكياس المائية (4%), التصلب (1.5%)، الخراجات (1%)، حؤول (0.5%) والتخثر (0.5%).
يمكن لدراستنا ان تستنتج اهم الآفات المرضية التي تحصل في الرئة عند التشريح ما بعد الموت فضلا عن ظهور وجود فروقات معنوية لحصول الآفات الرئوية المجهرية بين ذبائح الأبقار البالغة عن اليافعة.

Introduction

Abattoir plays a key role in detecting various abnormalities and diseases in various countries (1). The main purpose of meat inspection at slaughterhouses is to provide animal disease information, the disease which causes economic losses by condemn of organs or even all carcasses if the disease spread in all the body such as tuberculosis, in addition to prevent the public health hazards (2).

Meat is considered a major source of protein and numerous nutrients, including iron, vitamins B, and zinc. Cattle are considered to be the main source of animal protein for the Iraqi population, where the consumer demand for animal proteins is increasing annually. Lung is a vital organ of the body and susceptible for several lesions indicative for disease conditions because of their particularities in physiology and histology. The most important factors that aggravate and promote pulmonary diseases are the deterioration of hygienic conditions (3).

In Al-Najaf abattoir, there are a lot of pulmonary lesions in cattle discovered by the veterinarians through their work in the abattoir for example, pneumonia, tuberculosis, hydatidosis, abscesses, pigmentation (haemosidrosis), atelectasis, emphysema, aspirated blood, calcification, congestion and haemorrhage and others.

This study aimed to achieve microscopic assessment for pulmonary lesions in Al-Najaf abattoir through investigating and classifying these lesions.

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Materials and Methods

Regular visits were paid to Al-Najaf abattoir during the period from January to March 2019. Routine postmortem examination to slaughtered cattle was carried out with particular attention to the respiratory system. Lungs from 220 cattle were collected and thoroughly examined. Two hundred of them showed gross lesions (from left and right lung equally), other twenty were normal in texture and morphology, used as a control.

All observed lesions were recorded and then tissue pieces measured as (1 cm X 1 cm) were sampled and transferred in a plastic container which contains formalin 10%, to the tissue processing unite in faculty of veterinary medicine, University of Kufa.

The obtained specimens used for routine H&E staining (4) and Masson's trichrome staining (5) to study the microscopic changes in lung tissue.

Data were analyzed by using statistical analysis system program (6), and chi-square test was used to determine the significant differences among the groups (young and adult).

Results

Microscopic examination

The microscopic examination of the sections of affected lung used to recognize different lesions and their numbers and percentages (Table 1). The most common lesions were pleural changes and bronchopneumonia while the metaplasia and thrombosis were the least common prevalent lesions

Table (1): Revealed different lesions that observed during microscopic examination with their numbers and percentages (No. of slaughtered diseased cattle = 200)

Pulmonary lesion	Young*	Adult**	Total number of lesion	Percentage %
Pleural changes	5	184	189	94.5
Bronchopneumonia	5	132	137	68.5
Pneumonia	6	108	114	57
Emphysema	6	82	88	44
Atelectasis	6	78	84	42
Fibrosis	3	71	74	37
Angiogenesis	9	61	70	35
Congestion	5	60	65	32.5
Consolidation	0	39	39	19.5

Haemorrhage	2	31	33	16.5
Hemosiderin deposition	0	31	31	15.5
Hyperplasia	0	30	30	15
Desquamation (exfoliation)	0	20	20	10
Tuberculosis	0	11	11	5.5
Hydropic degeneration	0	9	9	4.5
Oedema	0	9	9	4.5
Hydatid cyst	0	8	8	4
Sclerosis	0	3	3	1.5
Abscesses	0	2	2	1
Metaplasia	0	1	1	0.5
Thrombosis	0	1	1	0.5

* Young cattle no. = 12. ** Adult cattle no. = 188.

The present results indicated the existence of specific and nonspecific lung affections in slaughtered cattle. Some of these are zoonotic diseases of major importance to public health, such as Echinococcosis and tuberculosis. The incidence of various pathological conditions in the lungs is considered high. This may be caused by chemical, physical or biological damages as well as the structural and histological properties of the lung (7). This research has a very high prevalence of pulmonary lesions compared to previous studies, when (8) and (9) were published by Nekemit Municipal Abattoir (15.5%) and Jimma Municipal Abattoir (46.22%) respectively. This increased prevalence of lung lesions in Al-Najaf abattoir could be related to weak disease prevention and management in the region.

Below the microscopic description of the lesions in the pulmonary sections:

- **Lobar pneumonia**

All stages of lobar pneumonia can be recognized in affected lung of slaughtered cattle. The congestion which represent the first stage (Fig.1), then prominent red hepatization which include presence of erythrocytes in alveolar spaces, inflammatory cells infiltration, particularly neutrophils (Fig.2). The third stage which is characterized by fibrin deposition, fibrinopurulent exudate in alveolar spaces and disintegration of RBCs and hemosiderin deposition (Fig.3), the final stage showed organization of the entire lobe (Fig.4).

- **Bronchopneumonia**

We classified the bronchopneumonia regarding the type of exudate in the pulmonary airways. Most of bronchopneumonia was containing necrotizing exudate while the fibrinous exudate was the least type of exudate found in bronchopneumonia (Table 2). The percentage of bronchopneumonia was revealed that significant differences between the incidence of bronchopneumonia of different classes for young and adult. (Table 3).

In the present study, the frequency of pneumonia and bronchopneumonia were (57%) and (68.5%), respectively. It was higher than the pneumonia registered by (10) in Southwestern Ethiopia, in Western Nigeria (9) and in Egypt (11), who reported (1.11%), (31.02%) and (28.7%) respectively, but slightly similar to (12), who reported the rate of pneumonia among 124 cattle was 80 (64.52%) in Karbala abattoirs.

Seasonal changes in weather conditions, wind and dust, particularly from autumn to winter and from the winter to spring, transportation stress, poor housing and overcrowding, all of these factors lead to development of cattle pneumonia (13). According to the present histopathological findings, the pneumonia could be classified mainly into lobar pneumonia, bronchopneumonia (mucous, purulent, mucopurulent, catarrhal,

fibrinous and necrotizing) and aspiration pneumonia. Parasitic pneumonia and neoplastic conditions were not recognized.

Table (2): Classification of bronchopneumonia appointing to number and percentage of each type

Type of bronchopneumonia	Young	Adult	Total number of lesion	Percentage %
Mucous bronchopneumonia	0	24	24	17.5
Purulent bronchopneumonia	3	17	20	14.6
Mucopurulent bronchopneumonia	0	25	25	18.3
Catarrhal bronchopneumonia	2	27	29	21.2
Fibrinous bronchopneumonia	0	2	2	1.4
Necrotizing bronchopneumonia	0	37	37	27
Total	5	132	137	100

Table (3):Percentages of different types of bronchopneumonia (P-value < 0.05)

Typeof bronchopneumonia	Young		Adult	
Mucous bronchopneumonia	0		A 100	
Purulent bronchopneumonia	15		A 85	
Mucopurulent bronchopneumonia	0		A 100	
Catarrhal bronchopneumonia	7		A 93	
Fibrinous bronchopneumonia	0		A 100	
Necrotizing bronchopneumonia	0		A 100	

A. Means significant difference between lung of young and adult.

- Mucous bronchopneumonia

Mucous- filled bronchial and bronchiolar spaces, increase goblet cells number and infiltration of lymphocytes, neutrophils in the interstitium of the lung are the main characteristics of the mucous bronchopneumonia (Fig.5).

-Catarrhal bronchopneumonia

The exudate of proteinaceous fluid and neutrophils and some macrophages (Fig.6).

-Mucopurulent bronchopneumonia

The bronchial lumen fills with mucous and suppurative substance that contain dead cells in addition to neutrophils and some mononuclear cells (Fig.7).

-Purulent bronchopneumonia

Lesions of purulent bronchopneumonia showed purulent exudate in alveoli, bronchi and bronchioles, bronchial epithelial hyperplasia and mononuclear intra and peribronchial infiltration predominantly with neutrophils infiltration (Fig.8).

-Necrotizing bronchopneumonia

The exudate is characterized by necrotizing dead cells with exfoliation of bronchial epithelial lining (Fig.9).

-Fibrinous bronchopneumonia

Lesions of fibrinous bronchopneumonia showed fibrinous exudation filling the bronchi which was

blue in color when stained with Masson's trichrome stain. Bronchial mononuclear infiltration, mucoid materials and haemorrhages were also detected (Fig.10).

-Aspiration pneumonia

The alveolar and bronchiolar spaces filled with blood contents, associated with a multifocal infiltrate of macrophages in the alveolar septum and interstitium of the lung (Fig.11).

The atelectasis frequency in this study was (42%) higher than the results registered by (14), they reported (6.4%) in cattle slaughtered in Hawassa Municipal Abattoir.

Atelectasis in this study may be due to exposure of animals to stress factors like overcrowding and dust and are associated with bronchopneumonia because of obstruction of bronchi or bronchioles with exudate or due to compression on the lung parenchyma as in hydatidosis (15).

Atelectasis

The alveoli were collapsed and their walls lie each to other, causing alveolar space narrowing or obstruction (Fig.12), and it was classifying into two types, obstructive (Fig.13) and compressive (Fig.14).

The table (4) revealed the numbers of these types that occurring in young and adult lung.

Table (4): Classification of atelectasis appointing to number and percentage of each type

Typeof atelectasis	Young	Adult	Total number of lesion	Percentage %
Compressive atelectasis	4	62	66	78.6
Obstructive atelectasis	2	16	18	21.4
Total	6	78	84	100

The results in table (5) showed there was significant difference in occurrence of atelectasis where comparison was conducted between the lungs of the different ages.

Table (5): Percentage of different types of atelectasis (P-value < 0.05)

Type of atelectasis	Young	Adult
Compressive atelectasis	6	A 94
Obstructive atelectasis	11	A 89

A. Means significant difference between lung of young and adult.

-Pleural changes

Some thickened pleura showed infiltration of inflammatory cells, particularly mononuclear cells and angiogenesis (Fig.15), others were without inflammatory cells and classified as mild (Fig.16), moderate (Fig.17) and sever pleural thickening (Fig.18).

Tables (6) and (7) revealed the microscopic classification of pleural thickening into mild, moderate and sever thickening and percentage of each type.

In the present study, the occurrence of pleural changes in the lung (94.5%) is greater than that recorded by (16) and (17) who reported 1.74% of abattoirs in Peninsular Malaysia and 12% of abattoirs in Eastern Cape, South Africa, respectively.

Pleuritis is a pleural membrane inflammation which covers and protects the lungs and can result in permanent fibrous adhesion between the lungs and the wall of the chest (18). This may be attributed to etiological variations, geographical regions, different meanings used, and seasonal

changes, personal observations, and conclusive pleurisy diagnosis by the various studies.

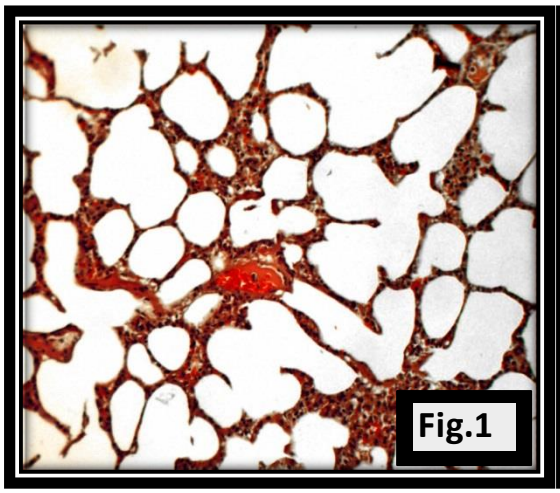
Table (6): Classification of pleural thickening, appointing to number and percentage of each type

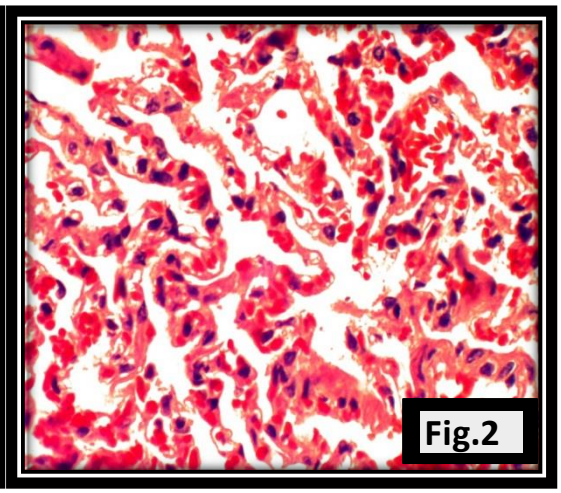
Type of pleural thickening	Young	Adult	Total number of lesion	Percentage %
Mild pleural thickening	3	69	72	38
Moderate pleural thickening	2	63	65	34.4
Mild pleural thickening	0	52	52	27.6
Total	5	184	189	100

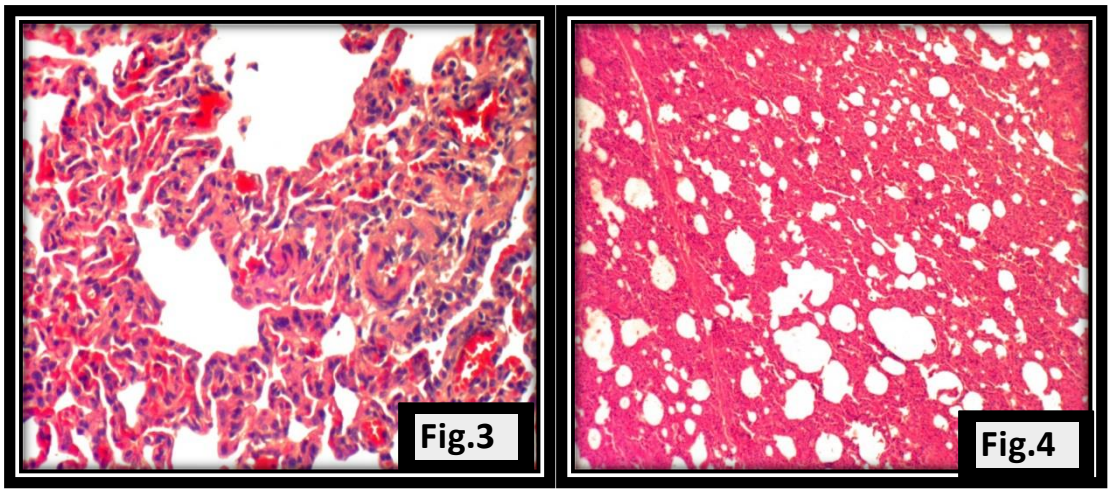
Table (7): Percentage of different types of pleural thickening (P-value < 0.05)

Type of pleural thickening	Young	Adult
Mild pleural thickening	4.2	A 96
Moderate pleural thickening	3	A 97
Sever pleural thickening	0	A 100

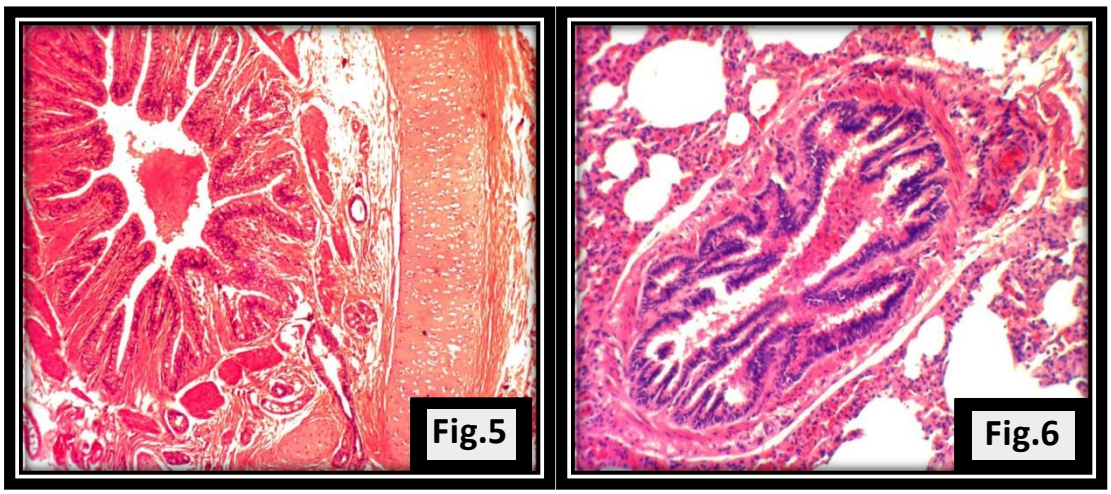
A. Means significant difference between lung of young and adult of the same side.

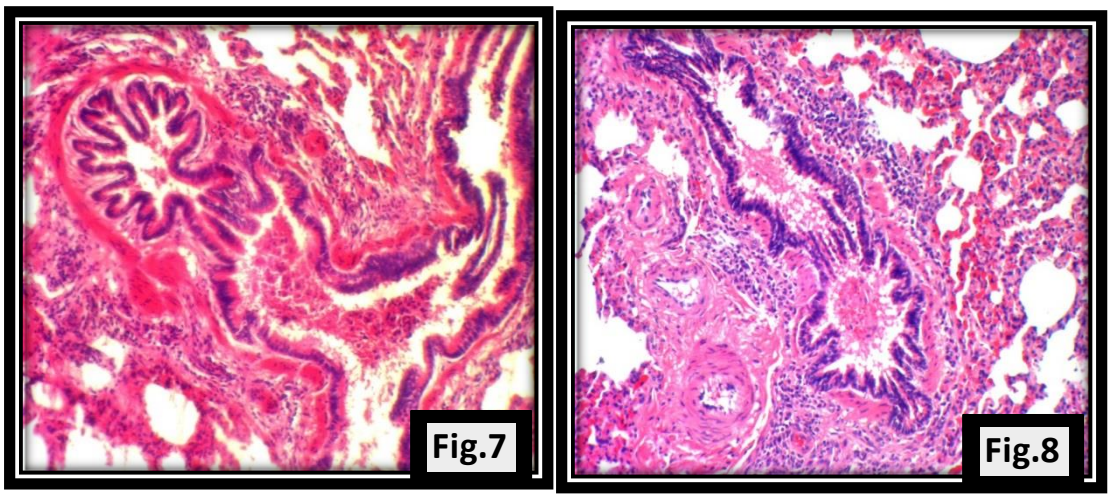


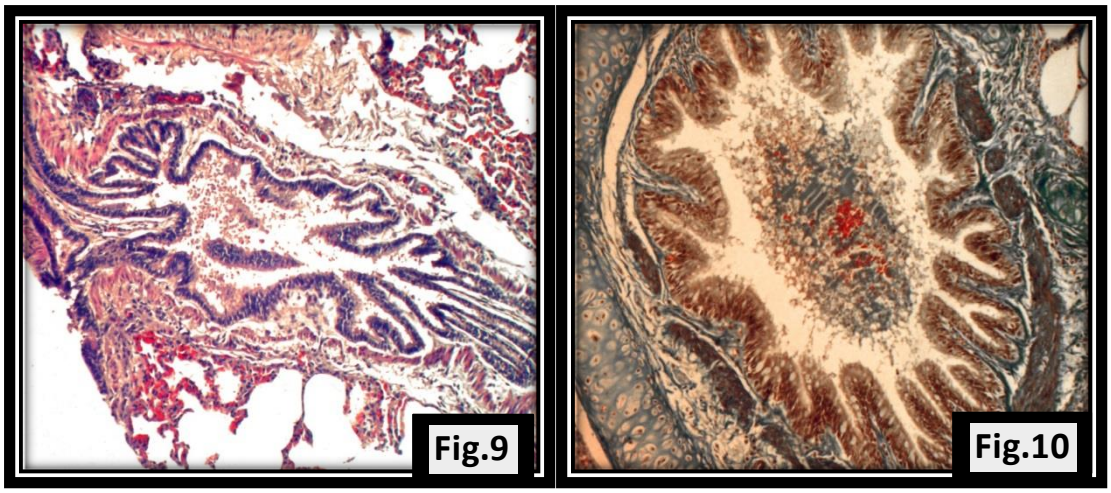




Figure(1): Congestion, thickening in the alveolar walls, Figure(2): Consolidation which includes presence of erythrocytes in alveolar spaces, proliferation of pneumocytes type II and serous materials deposition. Figure (3): Fibrin deposition, fibrinopurulent exudate in alveolar spaces, disintegration of RBCs and hemosiderosis. Figure (4): Organization of the entire lobe. (H&E stain) X100.







Figure(5):Mucous bronchopneumonia (H&E stain) 400X. Figure (6):Catarrhal bronchopneumonia.(H&E stain)200X. Figure (7): Mucopurulent bronchopneumonia (H&E stain) 200X. Figure (8): Purulent bronchopneumonia.(H&E stain) 100X. Figure (9): Necrotizing bronchopneumonia (H&E stain) 200X. Figure (10): Fibrinous bronchopneumonia.(Masson's trichrome stain) 400X.

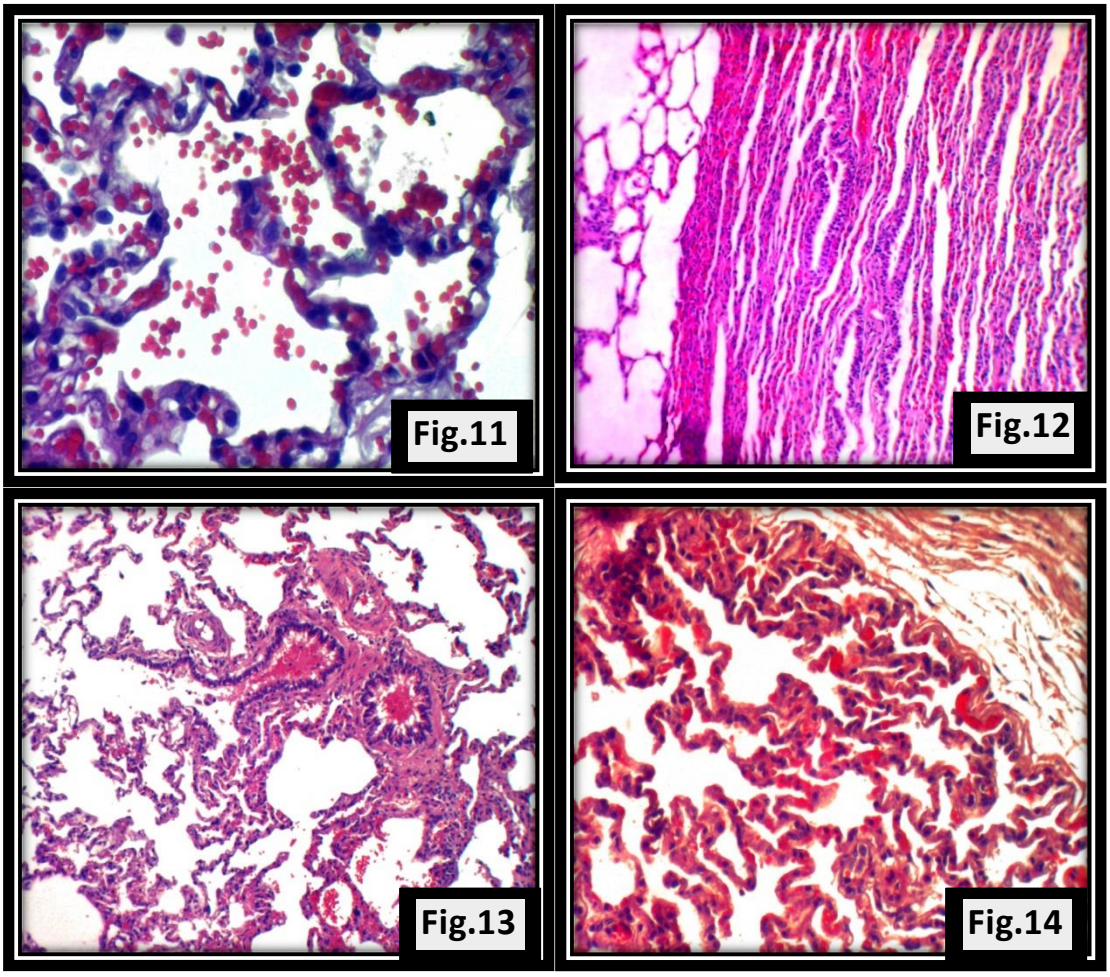


Figure (11): Aspiration pneumonia.(H&E stain) X200.Figure (12): Atelectasis. The right side of the field showed extensive atelectasis of the alveoli, whereas the left side showed normal alveoli (H&E stain) 200X. Figure (13): Obstructive atelectasis as a result of bronchiolar obstruction by hemorrhagic exudate (H&E stain) 100X. Figure (14): Compressive atelectasis due to compression of thickened inflammed surrounding pleura (H&E stain) 200X.

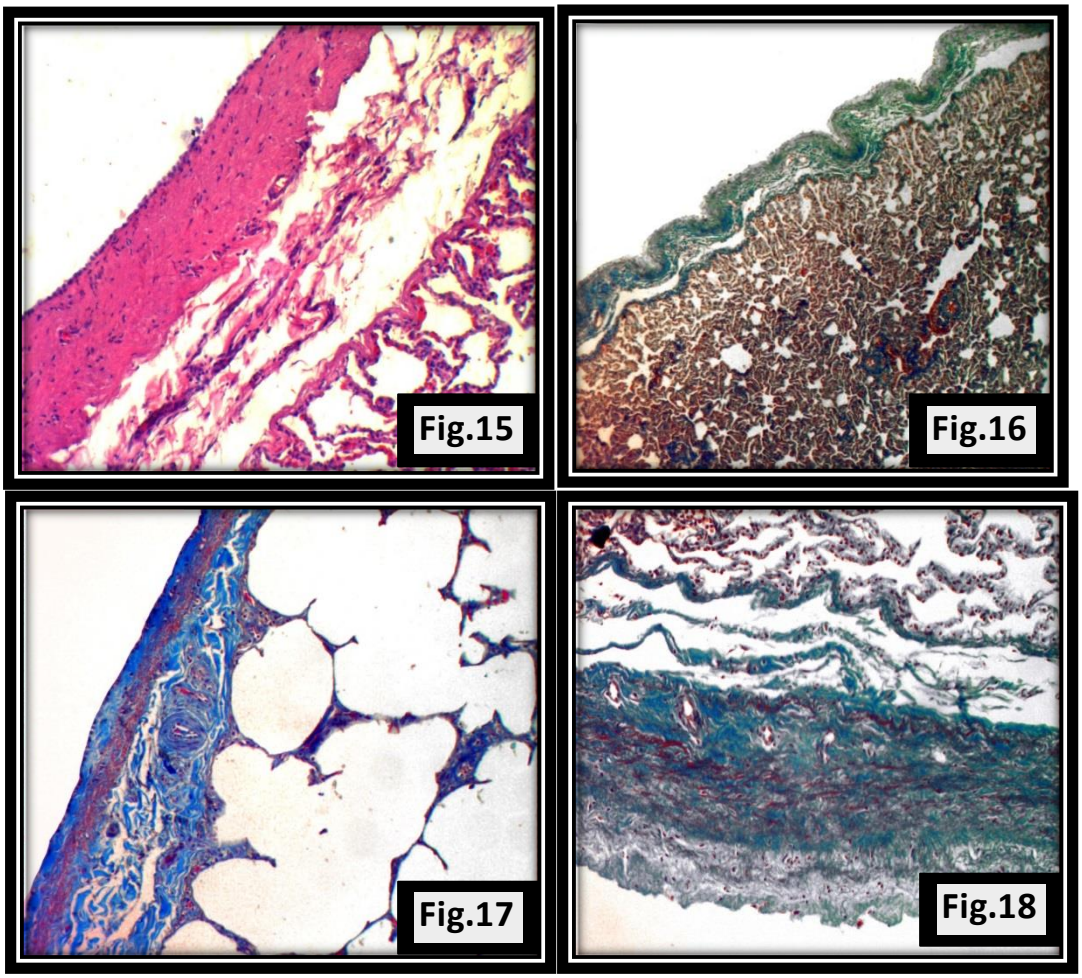


Figure (15): Pleuritis. Thickened pleura, infiltration of mononuclear cells, subpleural edema and angiogenesis (H&E stain,200X). Figure (16): Mild pleural thickening without infiltration of inflammatory cells (Masson's trichrome stain,100X). Figure (17): Moderate thickened pleura with angiogenesis (Masson's trichrome stain,100X). Figure (18): Sever thickened pleura with subpleural edema and angiogenesis (Masson's trichrome stain,200X).

This study was concluded that different microscopic lesions were diagnosed in the cattle slaughtered in Al-Najaf abattoir, the most common lesions were pleural changes (94.5%), and bronchopneumonia (68.5%), and there was significant difference between the prevalence of lung lesions between young and adult cattle.

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