Part IV :

Results

Clinical Data

No	Age	Sex	Duration	Site of Trauma	Type of isolated organisms
1	40	Male	6 months	Femur	Peptostrepococcus anaerobius-Clostridium perfringens-Bacteroides fragilis.
2	35	Male	3 months	Tibia	Staph. Coagulase-posilive-Peptostreptococcus asaccharolyticus
3	30	Male	3 years	Femur	Staph. Coagulase-negative
4	15	Male	3 months	Humerus	Staph. Coagulase-positive
5	20	Female	2 years	Femur	Staph. Coagulase-negative
6	46	Male	4 months	Tibia	Proteus mirabilis-Eubacterium lentum
7	7	Male	5 months	Femur	Staph. Coagulase-positive-Peptostreptococcus asaccharolyticus
8	40	Female	2 years	Humerus	Peptostreptococcus magnus
9	18	Male	8 months	Humerus	Staph. Coagulase-positive-Peptostreptococcus anaerobius
10	16	Female	2 years	Femur	Staph. Coagulase-positive-Clostridium perfringens
11	18	Male	2 years	Humerus	Staph. Coagulase-positive-Peptostreptococcus magnus
12	9	Female	4 months	Tibia	Staph. Coagulase-positive-Clostridium perfringens
13	25	Female	6 months	Femur	Staph. Coagulase-positive
14	23	Male	4 months	Tibia	Staph. Coagulase-positive
15	27	Male	11 months	Tibia	Staph. Coagulase-positive
16	36	Male	5 months	Femur	Staph. Coagulase-positive
17	38	Female	3 years	Tibia	Staph. Coagulase-negative
18	16	Male	2 months	Tibia	Staph. Coagulase-positive
19	31	Male	2months	Femur	Peptostreptococcus magnus-Clostridium perfringens-Bacteroides fragilis
20	22	Female	6 months	Femur	Peptostreptococcus magnus-Bacteroides fragilis
21	12	Male	2 months	Tibia	Clostridium histolyticum
22	9	Male	4 months	Tibia	Staph. Coagulase-positive-Clostridium perfringens
23	28	Male	3 months	Tibia	Peptostreptococcus anaerobius-Clostridium histolyticum
24	46	Male	4 months	Tibia	Proteus mirabilis-Peptostreptococcus anaerobius
25	33	Male	5 years	Tibia	Staph. Coagulase-positive
26	45	Female	6 months	Femur	Clostridium histolyticum
27	20	Female	2 months	Finger	Staph. Coagulase-positive
28	50	Male	4 months	Tibia	Proteus mirabilis-Clostridium perfringens
29	18	Female	3 years	Tibia	Staph. Coagulase-negative
30	30	Male	3 months	Humerus	Staph. Coagulase-positive

Results

This study includes 30 patients suffering from post-traumatic osteomyelitis. The results of this study are discribed in tables from (1-10).

Table (1) shows that (33.3%) of the sample were females, while males constitute (66.7%) of the sample.

Table (1) Sex and age distribution of the studied cases

Age group (year)	Female		Male		Total	
	No.	%	No.	%	No.	%
12	2	20	3	15	5	16.6
above 12	2	20	3	15	5	16.6
above 18	6	60	14	70	20	66.8
Total	10	33.3	20	66.7	30	100

Table (2) illusterates that (17.2%) of cases occur during the period of childhood. Another (17.2%) of cases occur in preadolescence and adolescence. The majorty of cases (65.6%) occur during adulthood. Only one case was suffering from osteomyelitis in the finger above 18 years.

Table (2) Distribution of cases according to age and site of trauma

Age group (year)	Site of Trauma						Total	
	Femur		Tibia		Humerus			
	No.	%	No.	%	No.	%	No.	%
12	1	10	4	28.6	–	–	5	17.2
above 12	1	10	2	14.3	2	40	5	17.2
above 18	8	80	8	57.1	3	60	19	65.6
Total	10	34.4	14	48.2	5	17.4	29	100

N.B: There was only one case suffering from osteomyelitis in the finger above 18 years

On studying the distribution of cases according to sex in relation to site of trauma. *Table (3)* shows that the higher percentage of tibial affection in males compared to females (78.5% - 21.5%) respectively. Also, the humerus was more affected in males than females (80% - 20%) respectively. There was no sex difference in affection of femur. There was only one female case suffering from osteomyelitis in the finger.

Table (3) Distribution of cases according to sex and site of trauma

Sex	Site of trauma						Total	
	Femur		Tibia		Humerus			
	No.	%	No.	%	No.	%	No.	%
Male	5	50	11	78.5	4	80	20	68.9
Female	5	50	3	21.5	1	20	9	31.1
Total	10	34.4	14	48.2	5	17.4	29	100

N.B: There was only one female suffering from osteomyelitis in the finger.

Table (4); illusterates that (10%) of cases have been suffering from persistent infection 3 - 5 years ago.

Table (4) Distribution of cases according to the duration elapsed since the trauma

Duration of trauma	No	%
< 6 months	16	56.6
6 – 12 months	6	20
1 – 2½years	4	13.4
3 - 5 years	4	10
Total	30	100

Table (5) shows the relation between type of isolated organisms and the duration elapsed since the trauma. It was found that Staph. coagulase-positive and Staph. coagulase-negative coincide with long duration.

Table (5) Relation between type of organisms and the duration elapsed since the trauma

Duration	Type of isolated organisms
< 6 months	P.asaccharolyticus-P.magnus-P.anaerobius-E.lentum-C.perfringens-C.histolyticum-B.fragilis-Staph.coagulase+ve-P.mirabilis.
6—12 months	P.anaerobius-P.magnus-C.perfringens-C.histolyticum-B.fragilis-Staph.coagulase+ve.
1—2 years	P.magnus-C.perfringens-Staph.coagulase+ve-Staph.coagulase-ve.
3 - 5 years	Staph.coagulase+ve-Staph.coagulase-ve.

N.B: P.asaccharolyticus: Peptostreptococcus asaccharolyticus.

P.magnus: Peptostreptococcus magnus.

P.anaerobius: Peptostreptococcus anaerobius.

C.perfringens: Clostridium perfringens.

C.histolyticum: Clostridium histolyticum.

E.lentum: Eubacterium lentum.

B.fragilis: Bacteroides fragilis.

P.mirabilis: Proteus mirabilis.

Table (6) and Fig.(1) show that (33.4%) of isolated organisms were mixed aerobe and anaerobe. (13.3%) were mixed anaerobic organisms only. Only (10%) were single anaerobic pathogen. Aerobic organisms only constitute (43.3%) of the isolated organisms.

Table (6) Number and Percentages of the organisms isolated from the studied cases

Category	No.	%
Mixed aerobic + anaerobic	10	33.4
Mixed anaerobic only	4	13.3
Single anaerobic pathogen	3	10
Aerobic only	13	43.3
Total	30	100

Fig. (1) Percentages of the organisms isolated from the studied cases

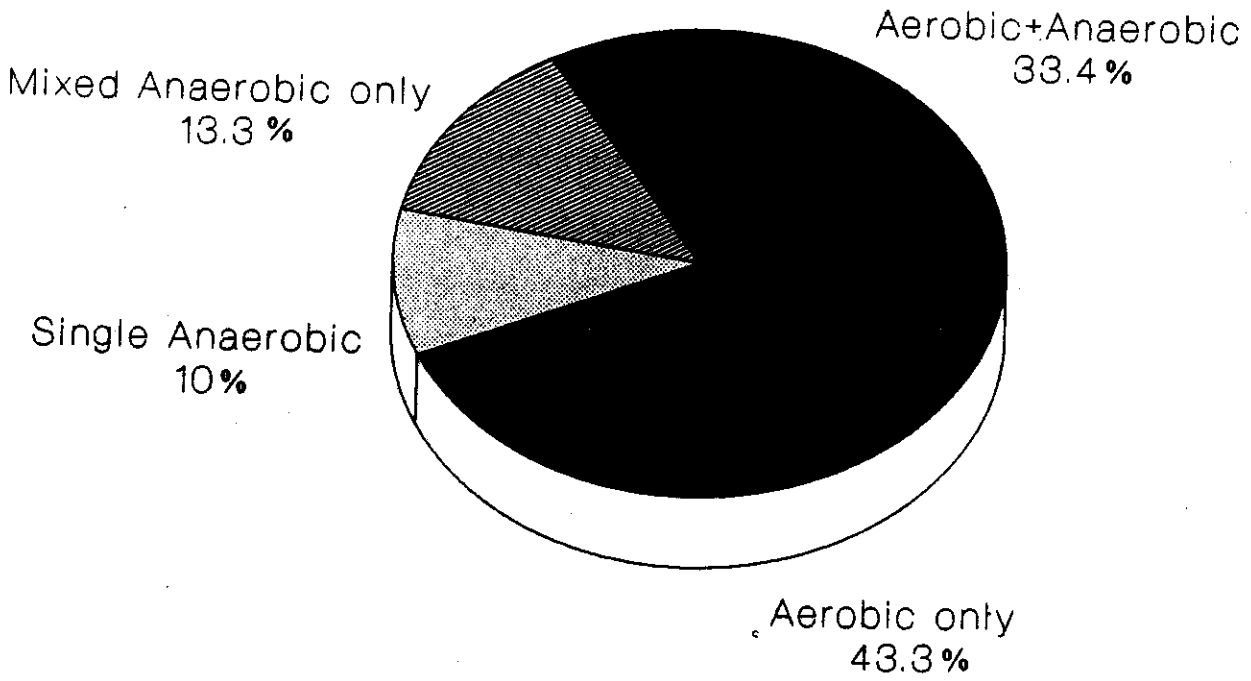


Table (7) and Fig.(2) illusterate the distribution of anaerobic organisms isolated from the studied cases. There were (43.5%) anaerobic gram-positive cocci, the most common organisms isolated in this group were Peptostreptococcus magnus and Peptostreptococcus anaerobius. While, anaerobic gram-positive spore-forming bacilli constitute (39.1%), the most common organism isolated in this group was Clostridium perfringens. Anaerobic gram-negative bacilli were (13.1%), only one organism was isolated Bacteroides fragilis. Anaerobic gram-positive non spore-forming bacilli constitute (4.3%), Eubacterium lentum was isolated from one case only.

Table (7) The Distribution of anaerobic organisms isolated from the studied cases

Organism	No.	%
Gram-positive cocci:	10	43.5
- Peptostreptococcus magnus	4	17.4
- Peptostreptococcus asaccharolyticus	2	8.7
- Peptostreptococcus anaerobius	4	17.4
Gram-positive spore-forming bacilli:	9	39.1
- Clostridium perfringens	6	26
- Clostridium histolyticum	3	13.1
Gram-negative bacilli:	3	13.1
- Bacteroides fragilis	3	13.1
Gram-positive non spore-forming bacilli:	1	4.3
- Eubacterium lentum	1	4.3
Total	23	100

Fig.(2)Anaerobic organisms isolated from the studied cases

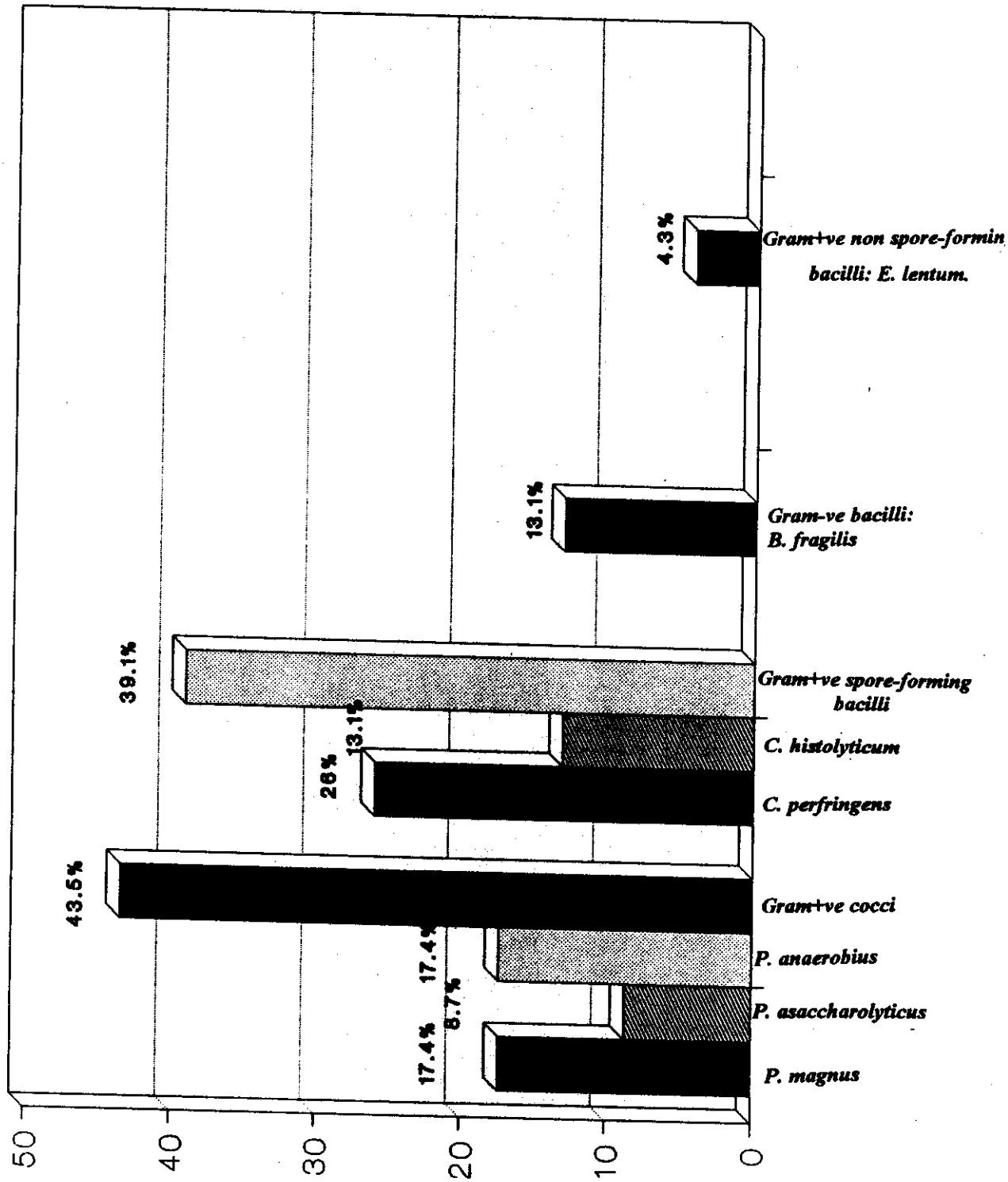


Table (8) shows the isolation rate of mixed infection among the studied cases. Peptostreptococcus species and Staph. coagulase-positive constitute (28.6%) of isolated organisms. Clostridium perfringens and Staph. coagulase-positive contribute to (21.6%) of isolated organisms.

Table (8) The rate of mixed infection among the studied cases

Mixed organisms	No	%
Peptostreptococcus species+Clostridium perfringens+ Bacteroides fragilis	2	14.3
Peptostreptococcus species + Staph. coagulase-positive	4	28.6
Peptostreptococcus species+Bacteroides fragilis	1	7.1
Clostridium perfringens+Staph.coagulase positive	3	21.6
Peptostreptococcus species + Clostridium histolyticum	1	7.1
Peptostreptococcus species+Proteus mirabilis	1	7.1
Clostridium perfringens+Proteus mirabilis	1	7.1
Eubacterium lentum+Proteus mirabilis	1	7.1
Total	14	100

Table (9) shows that there were 16 cases, show single isolates (18.75%) anaerobic organisms and (81.25 %) aerobic organisms.

Table (9) Rate of the single aerobic and anaerobic isolates among the studied cases

Type of	organisms	No.	%
Anaerobes	P. magnus	1	6.25
	C.histolyticum	2	12.5
Aerobes	Staph. coagulase+ve	9	56.25
	Staph. coagulase-ve	4	25
	Total	16	100

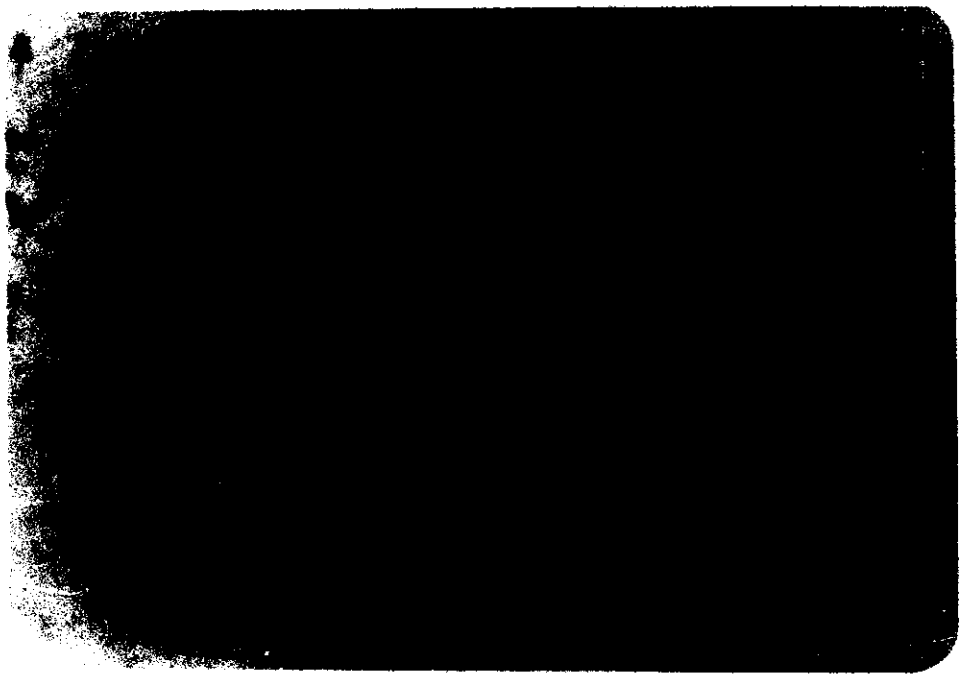
N.B: P.magnus: Peptostreptococcus magnus.

C.histolyticum: Clostridium histolyticum

Table (10) shows that the highest aerobic organisms only and mixed aerobic and anaerobic organisms (42.8%) for each were in the tibia. The finger affection was due to only aerobic organism. Humerus affection show the same percentage (40%) due to aerobic organisms only and mixed aerobic and anaerobic organisms. The aerobic organisms affecting the femur show higher percentage than all other isolates.

Table (10) Distribution of organisms according to site of trauma

Site of trauma	Type of organisms								Total	
	aerobic only		Single anaerobic		Mixed anaerobic		Mixed aerobic+anaerobic			
	No	%	No	%	No	%	No	%	No	%
Femur	4	40	1	10	3	30	2	20	10	100
Tibia	6	42.8	1	7.2	1	7.2	6	42.8	14	100
Humerus	2	40	1	20	-	-	2	40	5	100
Finger	1	100	-	-	-	-	-	-	1	100
Total	13	43.3	3	10	4	13.3	10	33.4	30	100



Peptosterptococcus magnus

Peptosterptococcus magnus:

This organism was isolated from 4 cases. In 3 cases, the organism was found mixed with Bacteroides fragilis, Clostridium perfringens and Staph. coagulase-positive.

Macroscopic examination:

Small, opaque, grayish white, low convex, non-hemolytic colonies.

Microscopic examination:

Large, gram-positive cocci, arranged in clumps.

API 20A identification:

Gelatin hydrolysis and catalase tests were positive. All other tests were negative, as the API 20A identification in anaerobic cocci divided into spp. 1 and 2. So, P.magnus was differentiated by its large size of its cells appeared by gram-stain.

Peptostreptococcus anaerobius

Peptostreptococcus anaerobius:

This organism was isolate from 4 cases mixed with Clostridium perfringens, Staph. coagulase-positive, Clostridium histolyticum and Proteus mirabilis.

Macroscopic examination:

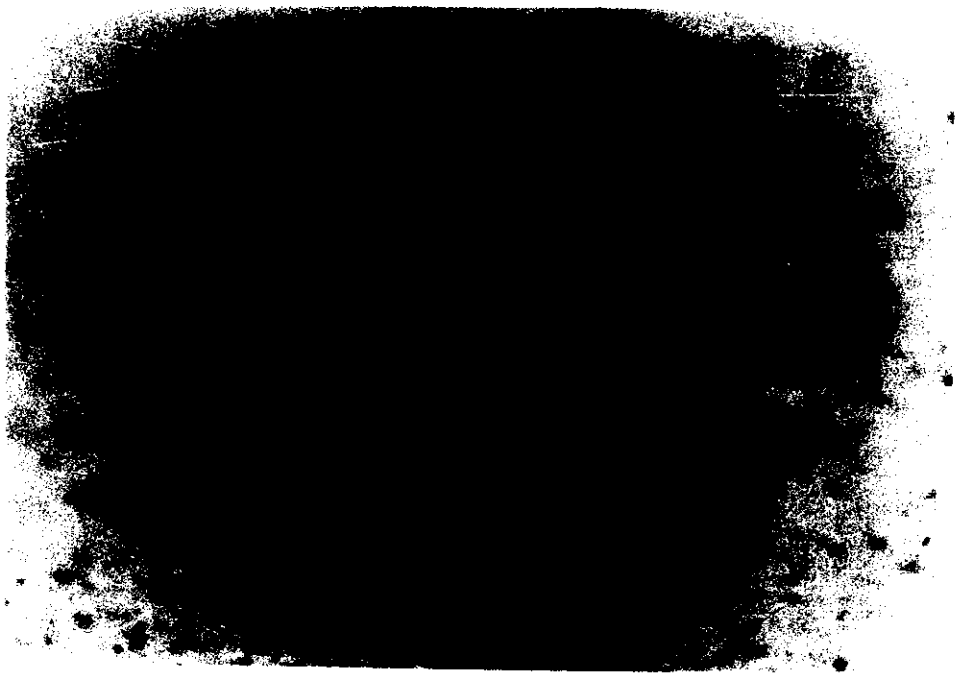
Small, flat, grayish-white, non-hemolytic colonies.

Microscopic examination:

Gram-positive cocci, arranged in short chain, pairs or single.

API 20A identification:

All tests were negative except gelatin hydrolysis test was positive.



Peptostreptococcus asaccharolyticus

Peptostreptococcus asaccharolyticus:

This organism was isolated from 2 cases. It was found mixed with Staph. coagulase-positive.

Macroscopic examination:

Very small colonies, circular, entire, few in numbers, lemon-yellow, non-hemolytic colonies.

Microscopic examination:

Gram-positive cocci, arranged in clumps.

API 20A identification:

Indole and catalase tests were positive. All other tests were negative.

Clostridium perfringens

Clostridium perfringens:

This organism was isolated from 6 cases. It was found mixed with Peptostreptococcus anaerobius, Peptostreptococcus magnus, Staph. coagulase-positive and Proteus mirabilis.

Macroscopic examination:

The colonies on columbia blood agar were surrounded by double zone of hemolysis. Some times swarming was present.

Microscopic examination

Gram-positive with spore-forming rods, pleomorph and some times appeared as gram-positive rods without spore-forming.

API 20A identification:

Glucose, lactose, saccharose, maltose and trehalose were fermented. Gelatin hydrolysis was positive. Also, in 2 cases glycerol, mannose and sorbitol were fermented.

Clostridium histolyticum

Clostridium histolyticum:

This organism was isolated in 3 cases. One of them was mixed with Peptostreptococcus anaerobius, while in the other 2 cases was in pure culture. At first, it gave a negative aerobic culture but, after subculture, it was grown on blood agar under aerobic conditions.

Microscopic examination and API 20A identification:

Gram-positive bacilli, pleomorph, single or pairs. Only gelatin hydrolysis test was positive.

Bacteroides fragilis

Bacteroides fragilis:

It was isolated in 3 cases, one of them was mixed with Peptostreptococcus magnus.

Macroscopic examination:

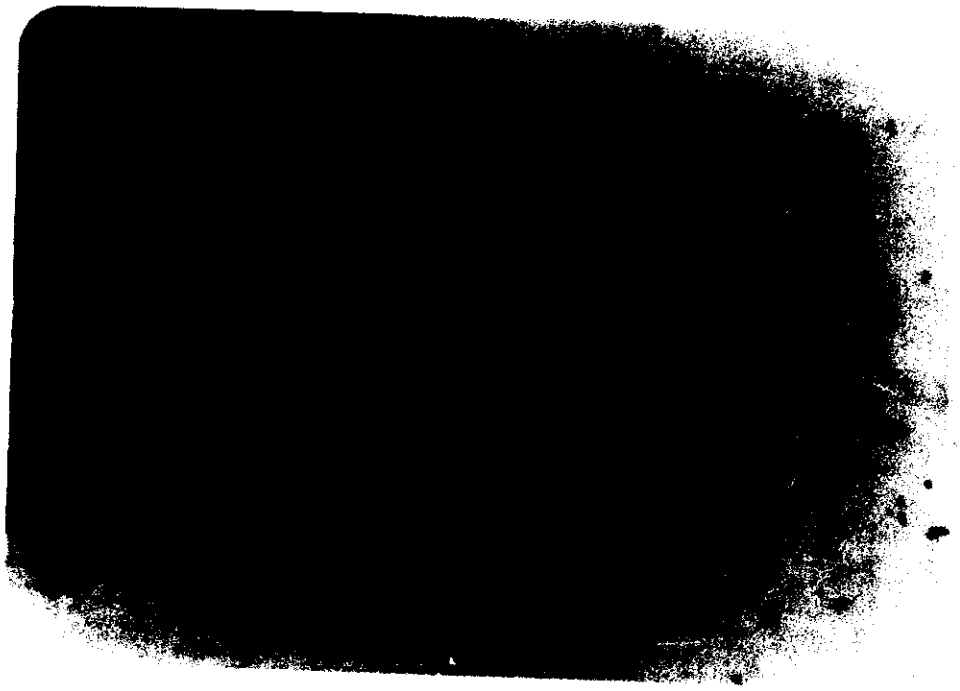
Rounded, convex, whitish, non-hemolytic colonies.

Microscopic examination:

Gram-negative bacilli, pleomorph, pale with irregular staining

API 20A identification:

Glucose, lactose, saccharose, maltose, xylose, cellobiose and raffinose were fermented. Esculin hydrolysis and catalase tests were positive.



Eubacterium lentum

Eubacterium lentum:

This organism was isolated from one case, mixed with Proteus mirabilis.

Macroscopic examination:

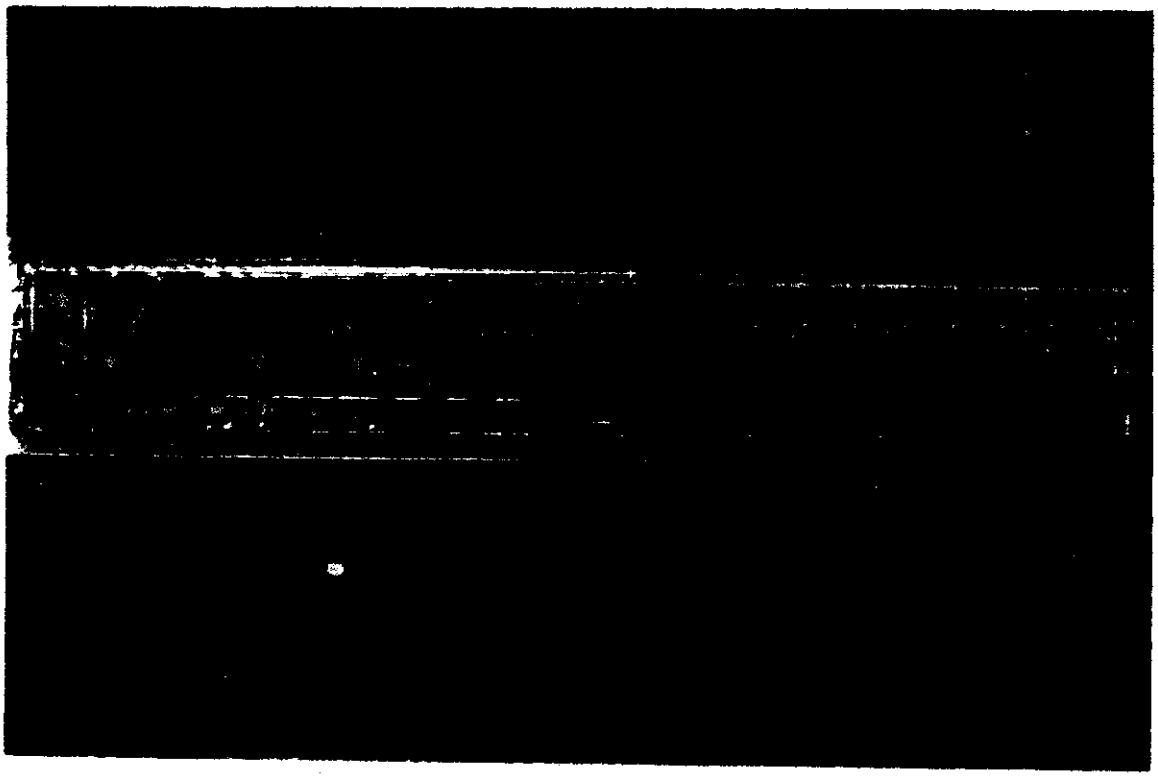
Small, rounded, convex, opaque, grayish-white, non-hemolytic colonies.

Microscopic examination:

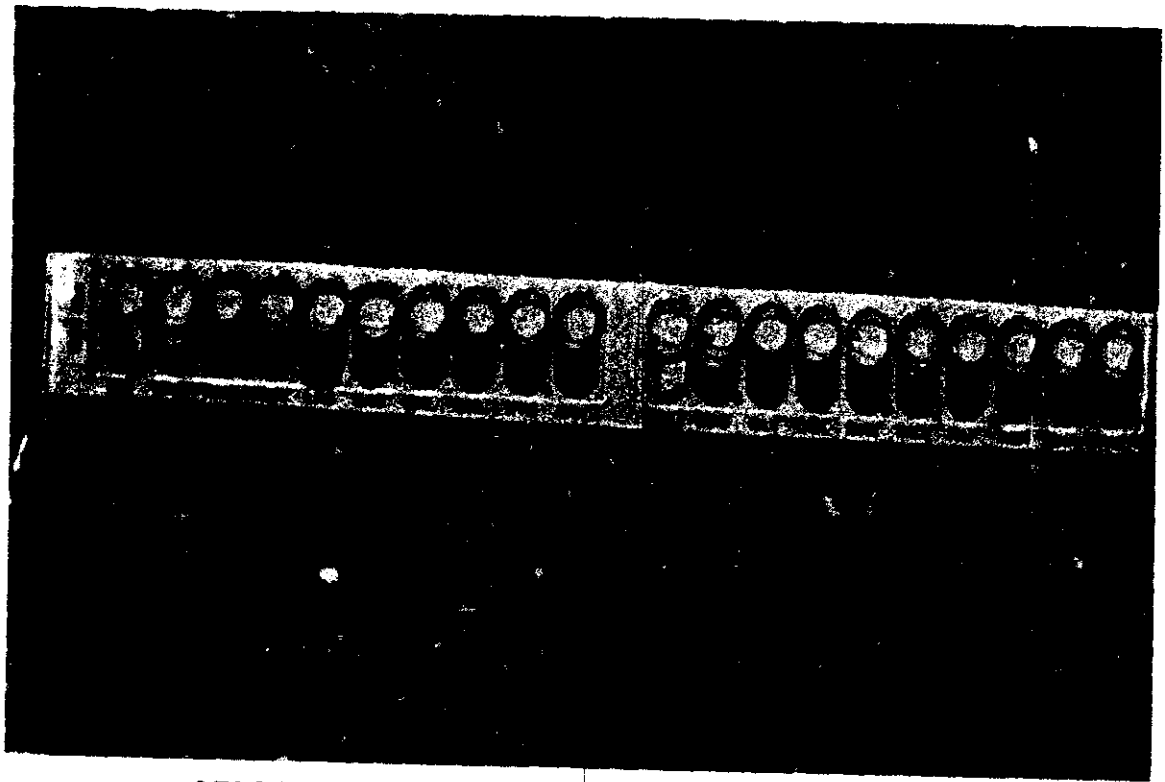
Gram-positive, non spore-forming bacilli, short and diphtheroidal arrangement.

API 20A identification:

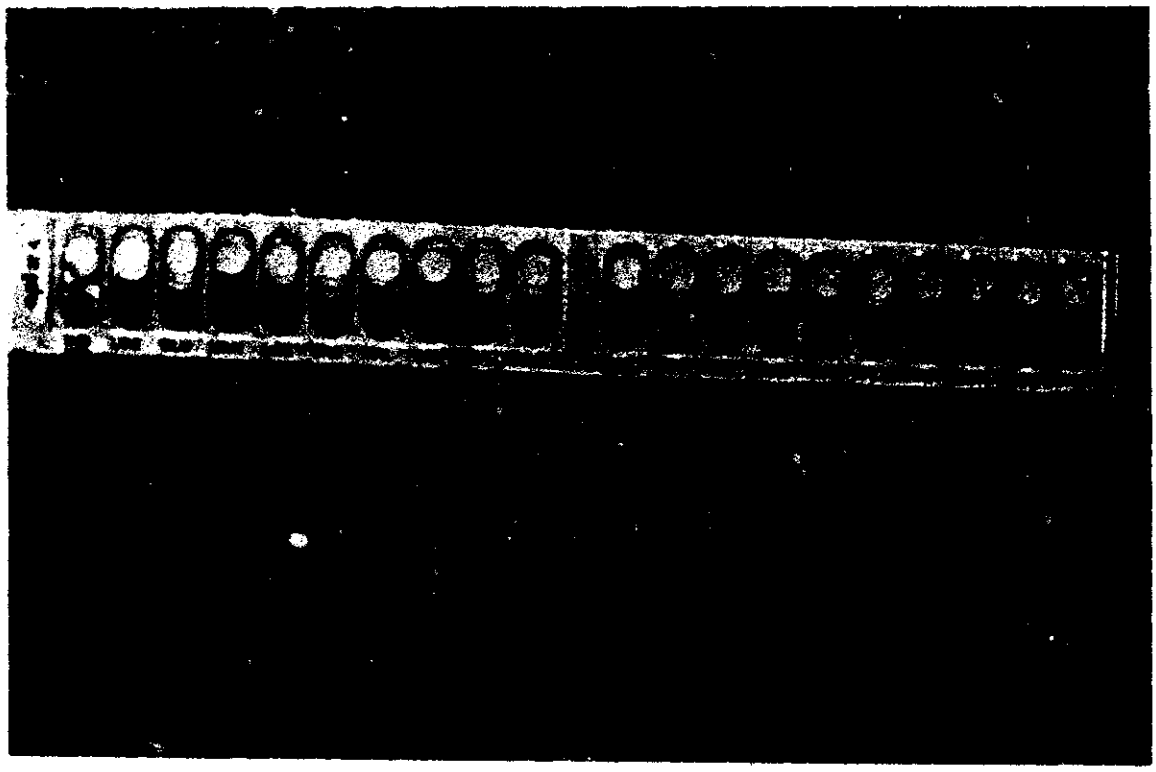
All tests were negative, except catalase test was positive.



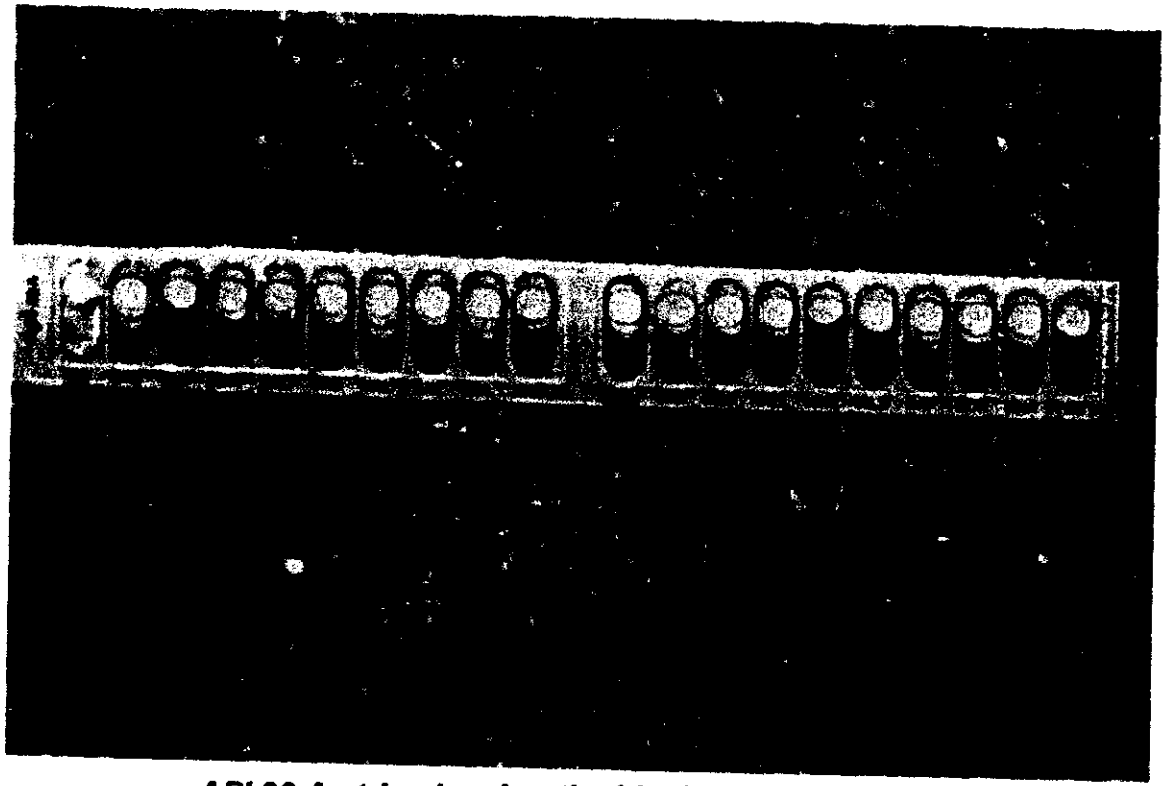
API 20 A strip before inoculation



API 20 A strip showing the biochemical reactions of Bacteroides fragilis



API 20 A strip showing the biochemical reactions of Clostridium perfringens.



API 20 A strip showing the biochemical reactions of Peptostreptococcus spp. 1, 2