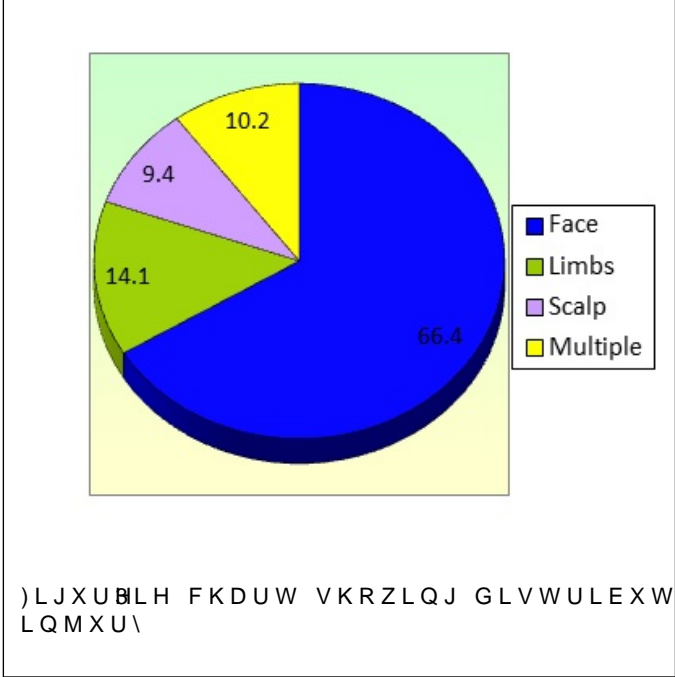
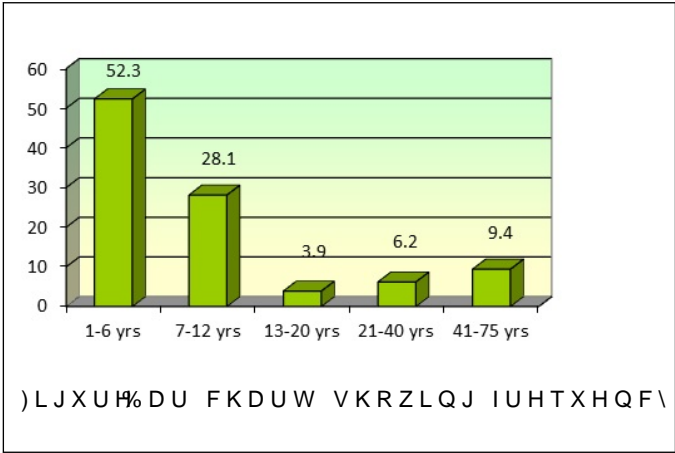




WKH GRJ ELWH FDVHV ZHUH UHFHLYHG G & DMRJLWK R I P R X Q G V Z I H U H F D E H U D W R I G  
0DUFK RI WKH YLFWLPV EHORQJHG WR WKH YXOVLOR O L I O V O R V W D Q G W K H V X H O  
DWWDNFV RFFXUUHG HLWKHU RXWVLGH WKH KRPKD G I : W K H O D V F W L P G R W E L W R L Q G L F  
SDYHPHQW VLGH & KLOGUHQ ZHUH DWWDNFN L Q G X P U L W H R Q U R D G S D M F R Q W F D V H V R U L H Q  
SXEOLF SODFHV , Q P D [ L P X P D W W D F N V V W Z L F R R L Q Z O X I G H I Q Y R O R Y H G F L E W K H D W G D F S H  
)LJXUHV DQG SDWLHQWV ZKR UHSRUWHG WR



LPPXQLJDWLRQ DJDLQVW UDELHV ORVW RI  
KRVSLWDO ZLWK WKH PHDQ GXUDWLRQ RI V  
SDWLHQWV LQ RXU VWXG\ ZHUH VXEM  
UHSDLU RI ZRXQGV 'HEULGHPHQW RQO\ ZD  
SHUIRUPHG LQ DQG ORFDO IODS FRYHU  
RI WKH SDWLHQWV QR VXUJLFDO SUR  
ZHUH OHIW WR KHDO E\ VHFRQGDU\ LQWHQV  
7DEOH 2XWFRPH RI WUHDWPHQW ZDV H  
IDLU LQ DQG SRRU LQ FDVHV (  
QRWHG LQ SDWLHQWV ZKR XQGHUZHQV GHE  
ELWH ZRXQGV IROORZHG E\ ZRXQGV

7DEOH 7\SH RI ZRXQGV LQ GRJ ELWH SDW  
RI GRJ DWWDNFV LQ SHUFHQW DJH  
7\SH RI ZRXQGV )UHTXHQF\ 3HUFHQW DJH

/DFHUDWLRQ  
3XQFWXUH  
\$YXOVLRQ  
7LVVXH ORVV  
&RPELQDWLRQV  
\$PSXWDWHG SDUW  
7RWDO

7DEOH 7\SH RI VXUJLFDO SURFHGXUHV SH  
6XUJLFDO SURFHGXUH )UHTXHQBHUFHQW DJH

'HEULGHPHQW RQO\  
'HEULGHPHQW ZLWK SULPDU\ UHSDLU  
'HEULGHPHQW ZLWK VNLQ JUDIWLQJ  
'HEULGHPHQW ZLWK ORFDO IODS FRYHU  
RI SDWLHQWV DFFRUGLQJ WR VLWH RI  
1RQH ZRXQGV OHIW WR KHDO E\ VHFRQGDU\  
LQWHQWLRQ

2YHU DOO IDFH ZDV WKH PRVW FRPPRQ LQ MXUHG DQDWLRPLFDO VLWH  
IROORZHG E\ OLPEV DQG VFDOS VHH WDEOH )DFH ZDV  
WKH FRPPRQ DIIHFWHG VLWH LQ FKLOGUHQ & R P S O L F D W L R Q V I H D U V D Q G O L P E V  
ZHUH PRVW FRPPRQ DIIHFWHG LQ ROGHU DJH JURXS RI I H D U V  
5HSRUWLQJ WLPH DIWHU WKH DWWDNFN ZDV IR P D M R U F R P S O L F D W L R Q V Z H U H Q R W H G L Q  
KRXUV LQ SDWLHQWV 7KH GRJ DWWDNFN LQ ZDV X O S U R Y R N H G V L Q K D G D Z R X Q G L Q I H  
SURYRNHG LQ RI WKH FDVHV , Q G R J D W W D F N V E D R W L F J O H G R J Z D V  
LQYROYHG LQ WKH DWWDNFN ZKHUHDV D JURXS SDFN RIDERJV DWWDNFNHG WKH YLFWLP  
LQ LQVWDQFHV , Q R X U V W X G \ L W Z D V R E V I D W H Q W K W W K W Q X P Z H R P Z H O R J V K L C  
SUHVHQQW DW WKH WLPH RI DWWDNFN ZHUH O D O H V L Q R R O G M P D D H J U R W A D W K R R S D U D V  
(RXQJHU DJH JURXS \$ KLVWRU\ RI WKH SDWLHQWV DWWDNFN ZDV QRW NQRZQ WR  
YLFWLP RU WKHLU UHODWLYHV LQ RI WKH FDVHV ZKHUH DV Y L F W L P V  
UHSRUWHG SUHYLRXV DWWDNFV E\ WKH V D H G R J R X U R S H U D W H G S D W L H Q W V U H T X L U  
O L N H V F D U U H Y L V L R Q V L Q D Q G O R F D O

7UHDWPHQW 7DEOH &RPSOLFDWLRQV RI GRJ ELWHV  
\$ WRWDO RI FDVHV UHSRUWHG WR RXU KRVSLWDO ZHUH UHIHUUHG IURP  
GLVWULFW DQG VXE GLVWULFW OHYHOV KR & S O L F D W L R Q V U H T X B O W L H Q W V W H W H G  
HPHUJHQF\ GHSDUWPHQW GLUHFWO\ IURP WKH VFHQH RI WKH LQMXU\ ODMRULW\ RI  
SDWLHQWV KDG DURXQG GRJ ELWH ZRXQGV VSUHDG RYHU WKH ERG\

8JO\ VFDU  
:RXQG LQIHFWLRQ  
7LVVXH ORVV  
3V\FKLDWULF LOOQHVV  
'HDWK GXH WR UDELHV  
1RQH  
/RVW WR IROORZ XS  
7RWDO

',6&866,21

'RJ ELWH LV D ZRUOGZLGH SUREOHP ,Q OL  
RI EHLQJ ELWWHQ E\ D GRJ WKDQ DQ\ RWKH



)LJXUH RUULI\ LQJ PLG DQG ORZHU IDFH PD  
UDELG GRJ &KLOG GLHG GD\ V ODWHU DIWHU DGPVLRQ

LQDGHTXDWH GRJ FRQWURO PHDVXUHV LQ  
SUREOHP LV WKH DODUPLQJ LQFUHDVH LQ  
URDPLQJ RI VWUHHW GRJV ZLWK WKHLU SX  
WKH FKLOGUHQ SOD\ LQJ LQ JURXQG DQG U  
ZDV REVHUYHG LQ RXU VWXG\ WKDW XQSUF  
FRPPRQHU WKDQ SURYRNHG DWWDFNV L H  
REVHUYDWLRQ ZDV PDGH E\ %DNHU > @ 6F  
)LJXUHV DQG



)LJXUH 'RJ ELWH ZRXQG OHIW FKHHN LQYR  
FRPPLVVXUH

'RJ V LOYROYHG LQ ELWLOJ RXU SDWLHQWV  
PD\ PDVLRQ DODUPLQJ ZKLFK GRHV QRW KDSSHQ ZL  
SHRSOH WLOO LW GLHV RU LV NLOOHG

,Q RXU VHULHV RI FDVHV GRJ ELWH  
DJH 7KLV PD\ UHIOHFW WKH QDWXUDO EHKDYL  
WKHP DW ULVN ORVW RI WKH YLFWLPV ZHUH  
REVHUYHG E\ OFKHLN HW DO > @ WKL  
ERIV LQ RXWGRRU DFWLYLWLHV DQG DUH  
VHULHV LQVWDQFH RI GRJ ELWH RFFXU  
2XU REVHUYDWLRQ UHJDUGLQJ WKH VHDV  
VXSSRUW WKH REVHUYDWLRQ PDGH E\ RWKHU  
ZKHUH PRVW GRJ ELWH LQFLGHQWV RFFXU  
> @ ,Q RXU YDOOH\ ZKLFK UHPDLQV FRYHU  
GXULQJ ZLQWHU GRJV DUH PRUH LUULWDEOH  
)XUWKHU EUHHGLQJ VHDVLRQ LV DOVR  
DJJUHVVLYH WR SURWHFW WKHLU SXSSLHV  
FRPSULVHG RI SDWLHQWV ZKLFK LV LQ  
&DVWURGDOH HW DO DQG 6XGDUVKDQ HW DO  
EHKDYLRU RI GRJV LQ UXUDO DUHDV DV  
UHSRUWHG E\ 5XPDQD HW DO > @ DQG





)LJXUH/DWH SKRWRJUDSK RI WKH VDPH SDWLHQW YKRWLQJ WKH FHOHFWU  
FRVPHWLF UHVXOW IROORZLQJ GHEULGPHW DOG > @ DOVR SHUIRUPHG SULPDU U



)LJXUH/DWH SRVWRSHUDWLYH SKRWRJUDSK RI WKH VDPH SDWLHQW YKRWLQJ WKH FHOHFWU  
H[FHOHQW UHVXOW

ORVW YLFWLPV LQ RXU VWXG\ KDG FODVV ,,  
HW DO > @ UHSRUWHG RI WKH ZRXQG  
EHWZHHQ RXU VHULHV DQG OLWHUDWXUH L  
:+2 FULWHULD DQ\ WUDQVGHUPDO ELWH L  
ZKLFK ZRXOG EH SUHYLRXVO\ ODEHOHG D  
FDVHV IURP SUHYLRXVO\ ODEHOHG DV ORZ  
GRJV XVXDOO\ DWWDFN IRU D EULHI GXUDW  
QRW EHHQ UHSRUWHG PFK LQ WKH OLWHU  
JURXS RI SDWLHQWV

ORVW RI WKH LQMXUH SDWLHQWV RXU VWXG  
UHSDLU RI WKH ZRXQGV GHEULGPHW DOG  
LQ DQG IODS FRYHU LQ SDWLHQWV )L

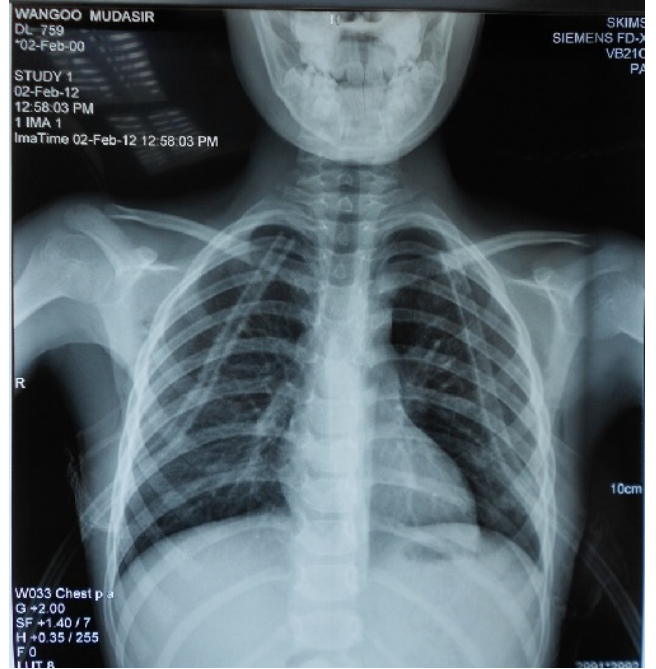
/LWHUDWXUH WKURXJKRXW WKH ZRUOG PR  
UHSDLU RI GRJ ELWH ZRXQGV DIWHU WKRU  
SDWLHQW YKRWLQJ WKH FHOHFWU OLNH  
GHEULGPHW DOG > @ DOVR SHUIRUPHG SULPDU U  
HPSKDLVJHG WKDW LI SURSHU DQG DGHTXD  
SDWLHQWV RI GRJ ELWHV LQFOXGLQJ WKR  
LPPXQLJDWLRQ UHSDLU FDQ EH XQGHUWDN  
KDV EHHWU FRVPHWLF RXWFRPH HVSHFLD



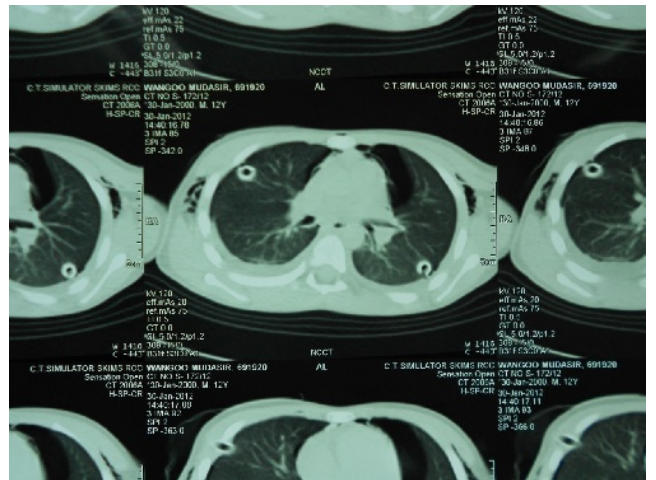
)LJXUHRJ ELWH ZRXQGV RI QRVH DQG XSSHU OLS LQ D ODG\ RI \HDUV¶  
DJH ORVW RI WKH XSSHU OLS KDQJLQJ E\ D QDUURZ SHGLFOH RI WLVVXH



)LJXUH XOWLSOH GRJ ELWH ZRXQGV LQ D ORVV RI VFDOS RQ RFFLSLWDO UHJLRQ



)LJXUH UD\ FKHVW RI WKH VDPH FKLOG VKR LQ SODFH



)LJXUH &7 FKHVW RI WKH VDPH FKLOG KHPRSQHXPRWKRUD[

,Q RXU FDVH VHULHV WKH FRVPHWLF DQG SDWLHQWV JRRG LQ IDLU LQ :KHQ ZH FRPSDUHG WKH ZRXQG KHDOLQJ F W\SH RI VXUJLFDO SURFHGXUH SHUIRUPHG LQ SDWLHQWV ZKR XQGHUZHGW GHEULGHPH ZRXQGV 6LPLODU ILQGLQJV ZHUH UHS DO > @ OFKHLN HW DO > @ /DFNPDQQ HW





)LJXUHDWH SRVWRSHUDWLYH SKRWRJUDSK)DIWUH6FBLPDLU)UHISDFBDS DFILPQQ D JLU  
ZRXQG DQG VSOLW WKLFNQHV VNLQ JUDIWUBIWLQVFRQS ZRXELWHDQSYXDFYLRTOXHQWUV  
VFDU UHYLVLRQV

7DNLQJ LQWR FRQVLGHUDWLRQ WKH FXUUHQW FRQDOLQJ V EPYHG RYHQWLQYH  
ODUJHVW UHSRUWHG GDWD DQG RXU RZQHSHULNQRHRXUWSRDXOMKLRH RUTSHFLDOO  
FRQFOXGHG WKDW SULPDU\ UHSDLU RI GRWKELGRJ ELQDFKLRQVHQJIPVWHDJWKPRWVKH  
ZRXQG FOHDQVLQJ DQG PLQLPDO GHEULGHGRJW YHQWLHSHUHQHQRVFLWLRQWRDQG  
IXQFWLRQDO UHVXOWV PDOWUHDWPHQW KXQJHU DQG WHUULWRUL  
6WXGLHV FRQGXFWHG ZRUOGZLGH UHSRUWLRUW RYKHYLEWWRV E\ PKHGRFDWZRR S  
ZHUH HLWKHU SHW DQG NQRZQ WR WKH YLWLRQJ RUKWHEUHQHQBZQHWRDQWZHUW  
FORVHO\ REVHUYHG GXULQJ WKH SRVW ELWHSHULRGUH @ EXW LQ RXU VWDWH WKH  
DUH QR HVWDEOLVKHG JXLGHOLQHV IURP WKH 6WDWH 0XQLFLSDO &RUSRUDWLRQ  
UHJDUGLQJ FRQWURO RI GRJ PHQDFH ZKHUH SUHYDOHQFH LV YHU\ KLJK DQG  
IXUWKHU QR JXLGHOLQHV KDYH EHHQ \HW HVWDEOLVKHG WR REVHUYH RU TXDUDQWL  
WKR VH GRJV WKDW ELWH 7KLV LV YHU\ LPSRUWDQW IRU WKH IDFV WKDW SDWLHQWV  
FRQLQXH WR UHFHLYH UDELHV YDFFLQDWLRQ LQ WKH SRVW ELWH SHULRG KDYH V  
GLVFRQLQXH WKHP DIWHU DGPLQLVWUDWLRQ RI WKH WKLUG GRVH RQO\ LI WKH GR  
VKRZV QR VLJQV RI UDELHV ZLWKLQ GD\DIWHU ELWLQJ WKH YLFWLP )LJXUH



)LJXUH7LVVXH H[SDQVLRQ EHLQJ GRQH WR

UJHRYHHDWKHSRFDURSHGDWHDH SKRWRJUDSK  
H[SDQVLRQ DQG UHPRYDO RI VFDUUHG DUH

,Q RXU VWDWH WKH SUREOHP RI LQFUHDVH LQ WKH QXPEHU RI VXFK YLFWLPLV LV  
PDLQO\ GXH WR WKH LQFUHDVH LQ WKH QXPEHU RI VWUHHW GRJV DV RXU FRPPXQLW\  
GRHV QRW QXUWXUH GRJV ,Q RXU FRPPXQLW\ RQH RI WKH UHVRQV LV WKDW SHRSO  
WKURZ ORW RI UHVLGXDO IRRG PDWHULDO WR ZWLVH WKIRUH FRQFOXGHS WKDVS WKH  
ZKLFK KHOSV WR LQFUHDVH WKH GRJ SRSXODMLHV) QXHU VWDWH HURKEEDQG LWRI  
D VWUHHW IUHH URDPLQJ GRJV XQGHU \*RKHU GHVWRXWRPH SUVWQH SDWLQQRXURI  
FRXQWU\ )LJXUH > @  
FDUH WR WKH SDWLHQWV VWDUWLQJ IUR  
KRVSLWDO ZLWK HPSKDVLV RQ WKRURXJK  
DQWLDELHV VKRWV 3ULPDU\ VXUJLFDU  
WKRURXJK ZRXQG FOHDQVLQJ DQG DGHTX  
FRVPHWLF UHVXOWV ZLWK QHHG IRU IHZHU  
)XUWKHU LW LV LPSRUWDQW WR HPSKDVLV  
JRYHUQPHQW QHHGV WR FXUE WKH JURZLQJ  
LQ RXU VWDWH DV RXU VWXG\ FOHDUO\ UH  
QXPEHU RI WKH GRJV UDWKHU WKDQ WKH C  
VHYHUH LQMXULHV )XUWKHU D SROLF\ EH P  
WKH FRPPRQ SXEOLF LV VDIH IURP WKHL  
ZRUOGZLGH

5)(5(1&(6

=LHOZ WKH SULPDU\ FORVXUH DSSURDFK  
QRVH 2WRODU\QJRO 3RO  
/DNHVWDQL'1\$ QVMDJ RI 'RJ %LWHV DQG  
(GLQEXUJK 5HVHDFK  
:HLVV +% )ULHQBQ 'QFLGHQFH RI GRJ  
WUHDWHG LQ HPHUJHQF\ GHSDUWPHQWV

